1997

Revised

EV1™

HVAC

Service Manual

CamScanner

CAUTION

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of all motor vehicles. If part replacement is necessary, the part must be replaced with one of the same part number or with an equivalent part. Do not use a replacement part of lesser quality.

The service procedures recommended and described in this service manual are effective methods of performing service and repair. Some of these procedures require the use of tools specifically designed for the purpose.

Accordingly, anyone who intends to use a replacement part, service procedure, or tool that is not recommended by the vehicle manufacturer must first determine that neither his safety nor the safe operation of the vehicle will be jeopardized by the replacement part, service procedure, or tool selected.

It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair or the possibility that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that these "Cautions" and "Notices" are not exhaustive; it is impossible to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

This vehicle has a high voltage power system. Disabling the system is required when working on or around the high voltage system and high voltage battery pack (other than testing the system using the procedures in this manual).

To help avoid severe shocks and burns and vehicle damage, always follow the cautions in this manual to disable the high voltage system. See the high voltage disable and enable procedure in the front of this service manual.

This vehicle is equipped with Supplemental Inflatable Restraint (SIR). Refer to "CAUTIONS" under "On-Vehicle Service" and the SIR Component and Wiring Location views in the "SIR Service Manual" before performing service on or around SIR components or wiring. Failure to follow "CAUTIONS" could result in possible air bag deployment, personal injury, otherwise unneeded SIR system repairs.

To help avoid accidental air bag deployment and personal injury, when servicing a vehicle that requires repair of the SIR system and another vehicle system, it is recommended that the SIR be repaired first using service manual procedures.

CAUTION

Saturn Service Manuals are intended for use by professional, qualified technicians. Attempting repairs or service without the appropriate training, tools, and equipment could cause injury to you or others and damage to your vehicle that may cause it not to operate.

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NOTICE

Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application.

The applicable service procedure will identify, where necessary, those fasteners that must be replaced after removal: or those fasteners that require thread lockers or thread sealant

UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and the joint clamping force, and may damage the fastener.

When you install fasteners, use the correct tightening sequence and specifications.

Following these instructions can help you avoid damage to parts and systems.

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GLOSSARY OF ACRONYMS

Acronym	Definition
ABS	Anti-Lock Braking System
AM	Amplitude Modulation
Amp	Ampere
APM	Accessory AC and DC Power Control Module. With PIM, makes up PEB
APS	Auxiliary Power Supply (part of APM)
BCA	Bias Control. Assembly
BPM	Battery Pack Module
BRS	Battery Reserve Switch
BTCM	Brake/Torque Control Module
BTSI	Brake Transmission Shift Interlock (GM)
CD	Compact Disc
cfm	Cubic Feet per Minute
eg	Center of Gravity
CHMSL	Center High-Mount Stop Lamp
CMC	Compressor Motor Controller (part of APM)
CPA	Connector - Positive Assurance
CR	Charge Receptacle
CRFM	Condenser Radiator Fan Module (part of HPVS)
CTPS	Check Tire Pressure System
DC	Direct Current
DLC	Data Link Connector
DERM	Diagnostic and Energy Reserve Module (SIR control module)
DIA	Dealer Installed Accessory
DM	Drive Motor
DRL	Daytime Running Light
E/M	English/Metric
ECM	Engine Control Module (used with internal combustion engines)
EHPS	Electro-Hydraulic Power Steering
EKP	External Keypad
EMB	Electro-Magnetic Brake (part of ABS)
EMI	Electromagnetic Interference
EPS	Electric Power Steering. Also see EHPS

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GLOSSARY OF ACRONYMS CONTINUED

Acronym	Definition
ETS	Electronic Traction System
EV	Electric Vehicle
EVO	Electronic Variable Orifice Control (in power steering pump)
FLIP harness	Forward Lamp - Instrument Panel Harness. Name of major EV low voltage wire
FM	Frequency Modulation
FOD	Front of Dash
g	Gram
GFI	Ground Fault Interrupt
GVMR	Gross Vehicle Mass Rating
GVW	Gross Vehicle Weight
HPVM	Heat Pump Ventilation Module
HPVS	Heat Pump Ventilation System. Similar to HVAC on ICE vehicles
HTCM	HPVS/Thermal Control Module
HV	High Voltage
HVAC	Heating, Ventilating, and Air Conditioning (on ICE vehicles. For EV, see HPVS).
HWS	Heated Windshield
HWS	Hand Wheel Sensor
Hz	Hertz (cycles per second)
I/O	Input(s)/Output(s)
IC	Integrated Circuits
IGBT	Isolate Gate Bipolar Transistor
IP	Instrument Panel
ISRV	Inside Rear View (mirror)
JB	Junction Block
KAM	Keep Alive Memory
kg	Kilogram
km	Kilometer
km/h	Kilometers per hour

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GLOSSARY OF ACRONYMS CONTINUED

Acronym	Definition
kPa	Kilo Pascals
kW	Kilowatt
kWh	Kilowatt-hour
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Left Front
LH	Left Hand
LHD	Left Hand Drive
LHJB	Left Hand Junction Block
LR	Left Rear
LVW	Loaded Vehicle Weight
m	Meter
MMC	Metal Matrix Composite (Rear Brake Drum Material)
MHz	Megahertz
mi	Mile(s)
MPH	Miles Per Hour
MSRP	Manufacturers Suggested Retail Price (includes dealer preparation)
MUX	Multiplex or Multiplexer
N	Newton(s)
NTF	No Trouble Found. Reported failure does not reoccur under test
OEM	Original Equipment Manufacturer
OSRV	Outside Rear View (mirror)
PCM	Propulsion Control Module (Drive Motor)
PDT	Portable Diagnostic Tool
PEB	Power Electronics Bay
PIM	Power Inverter Module
POA	Part of Assembly
PRND	Park-Reverse-Neutral-Drive, as in PRND Selector
PROM	Programmable Read Only Memory
PSOC	Pack State of Charge
PTC	Positive Thermal Coefficient. Term for resistive heating module
PWM	Pulse Width Modulation, or Pulse Width Modulated

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GLOSSARY OF ACRONYMS CONTINUED

Acronym	Definition
QDM	Quad Driver Module
RAM	Random Access Memory
RAP	Retained Accessory Power
RF	Right Front
RF	Radio Frequency
RH	Right Hand
RH	Relative Humidity
RHJB	Right Hand Junction Block
RMS	Root-Mean-Squared
ROM	Read Only Memory
RP	Reduced Performance
RPM	Revolutions Per Minute
RR	Right Rear
RSA	Run/Lock Shifter Assembly
SAE	Society of Automotive Engineers
SDL	Serial Data Link
SDM	Sensor Diagnostic Module
SIR	Supplemental Inflatable Restraint (air bag) system
SLA	Short-Long Control Arm (suspension system)
SOC	State of Charge (battery pack). Usually expressed as a percentage
SN	Service Now
SSPO	Saturn Service Parts Operation
SS	Service Soon
SWA	Steering Wheel Angle
TNF	Trouble - Not Found. Reported failure reoccurs but cause cannot be determined
TJB	Trunk Junction Block
TOD	Time of Day
TPA	Terminal — Positive Assurance
T/S	Turn Signal
IT	Telltale

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GLOSSARY OF ACRONYMS CONTINUED

Acronym	Definition
UART	Universal Asynchronous Receiver - Transmitter (communications IC)
UH	Under Hood
ULEV	Ultra-Low Emissions Vehicle
USOL	User State of Charge
V5B	5 Volt Supply
VAC	Voltage, Alternating Current
VF	Vacuum Fluorescence
VH	Vehicle Handling
VIN	Vehicle Identification Number
VTD	Vehicle Theft Deterrent
W	Watt
WSS	Wheel Speed Sensor (part of ABS)
WSW	Windshield Washer/Wiper
ZEV	Zero Emission Vehicle

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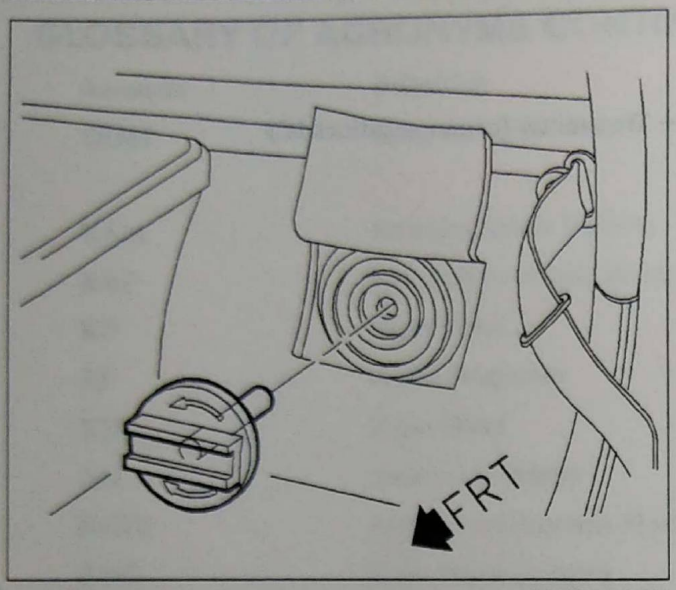

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HIGH VOLTAGE DISABLE

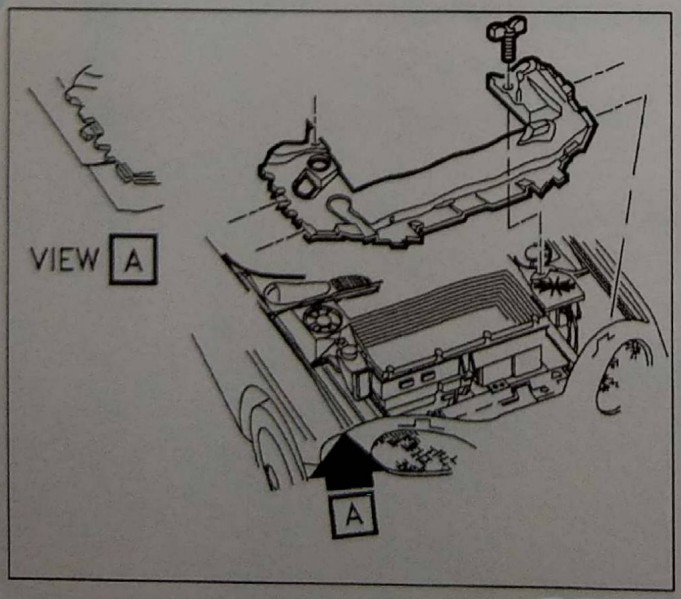
REMOVAL

CAUTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS, THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANYTIME SERVICE WORK IS BEING PERFORMED ON OR AROUND THE HIGH VOLTAGE SYSTEM. WHEN IN DOUBT, ALWAYS DISABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DISABLED.

1. Place the vehicle in the “RUN” mode.
2. Remove the manual disconnect knob.
   a. Tilt the drivers seat forward.
   b. Raise the carpet flap, located on the battery tunnel behind the drivers seat.
   c. Turn the manual disconnect knob counterclockwise and pull the manual disconnect knob straight out.

IMPORTANT: An audible click should be heard when turning the manual disconnect knob. This click indicates the automatic disconnect relays have opened.

3. Verify high voltage has been removed.
   a. Connect scan tool to the data link connector (DLC) and run the High Voltage special test. Battery pack module (BPM) diagnostic trouble codes (DTCs) 312, 280 and/or 275 should be present, which indicates BPM and auto disconnect recognized a high voltage disconnect.
   b. If test fails, refer to service manual “High Voltage Special Test Failed“ in the “Battery and Charging System Service Manual.”
4. Remove engine compartment sight shield.



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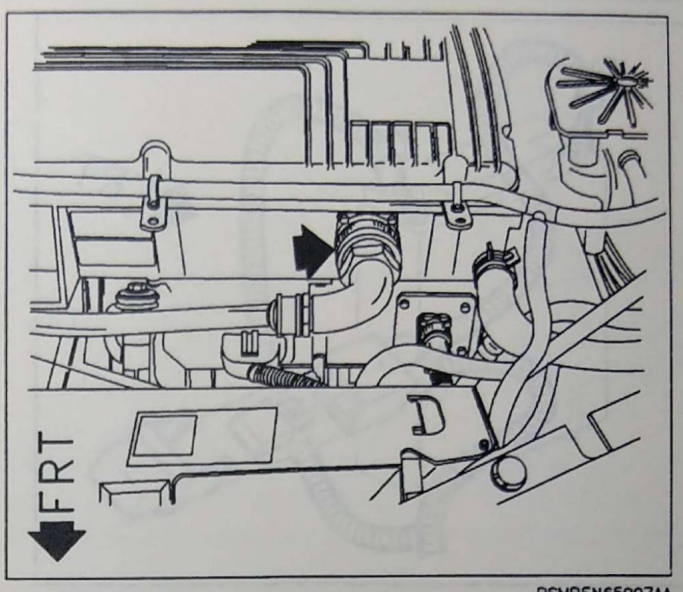
CAUTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS. ALWAYS ASSUME THE HIGH VOLTAGE IS PRESENT WHEN DISCONNECTING THE CHARGE RECEPTACLE TO PIM CONNECTOR. HO NOT ALLOW THE CONNECTOR BODY TO TOUCH THE PINS OF THE PIM WHEN REMOVING THE CONNECTOR.

5. Remove the charge receptacle to power inverter module (PIM) cannon connector using one hand.



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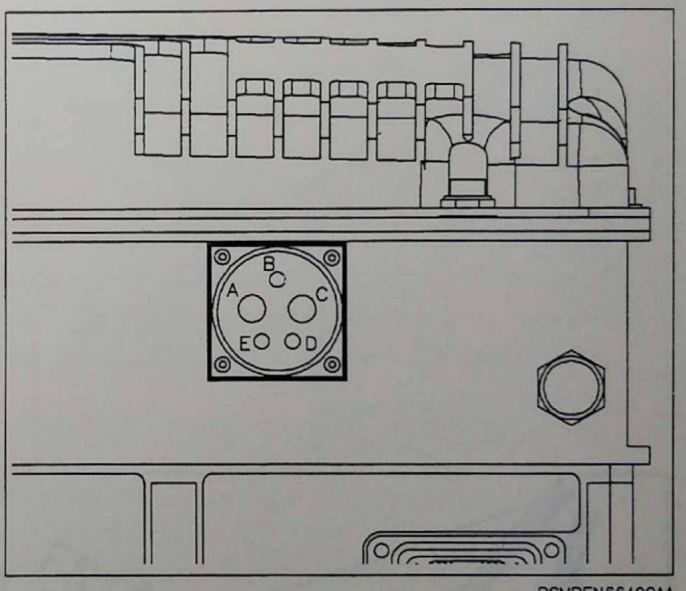
6. Using a DVOM and only one hand, measure from pin A of the PIM to chassis ground and from pin C of the PIM to chassis ground and from pin A to C. All measurements should be less than 10 volts. Pin C and Pin A are the large high voltage pins on the PIM.
   a. If the voltage is less than 10 volts, high voltage system is disabled.
   b. If the voltage is greater than 10 volts, refer to the "High Voltage" section in the "Battery and Charging Service Manual."



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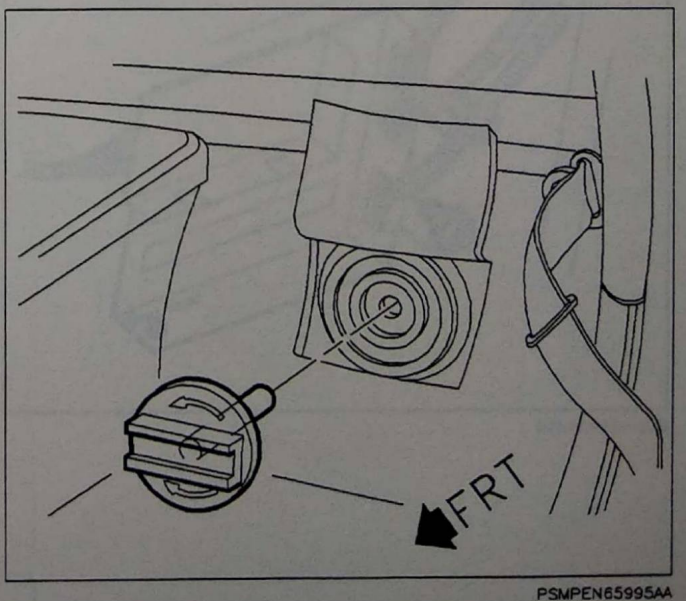
HIGH VOLTAGE ENABLE

INSTALLATION

1. Install charge receptacle to PIM cannon connector.
2. Install engine compartment sight shield.
3. Tilt driver's seat forward.
4. Raise the carpet flap, located on the battery tunnel behind the driver's seat.
5. Install the manual disconnect knob by pushing the shaft straight into the hole and turning clockwise.
6. Clear all DTCs using the scan tool.



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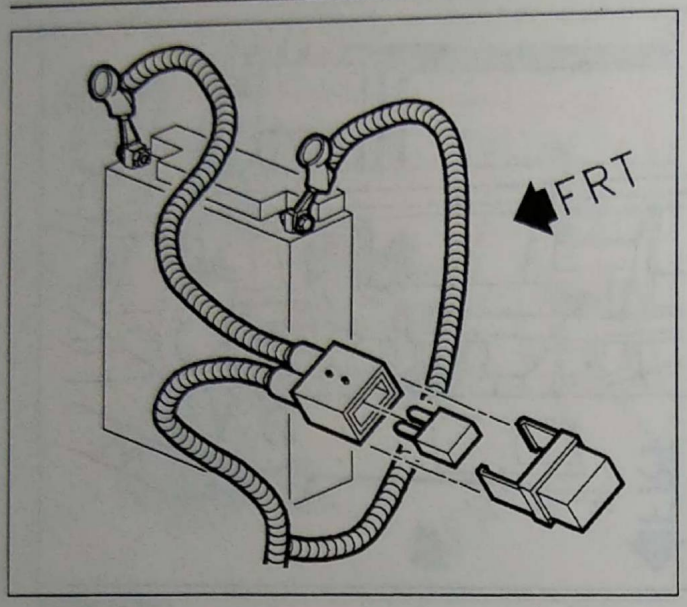

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12 VOLT SYSTEM DISABLE^

CAUTION: DISABLE THE 12 VOLT ELECTRICAL SYSTEM TO HELP AVOID PERSONAL INJURY OR POSSIBLE DAMAGE.

IMPORTANT: The key pad must be in the LOCK mode for two minutes prior to performing the following step. Failure to do so could result in the loss of memory that retains the battery pack state of charge. If this occurs refer to “Battery Pack and Charging System” service manual for details.

1. Remove the cover on the 60 amp maxi fuse holder located in the negative auxiliary battery cable.
2. Remove the 60 amp maxi fuse.

12 VOLT SYSTEM ENABLE

1. Install 60 amp maxi fuse located on the negative auxiliary battery cable
2. Place cover on maxi fuse holder.

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SIR SYSTEM

< ON VEHICLE SERVICE

SERVICE PRECAUTIONS

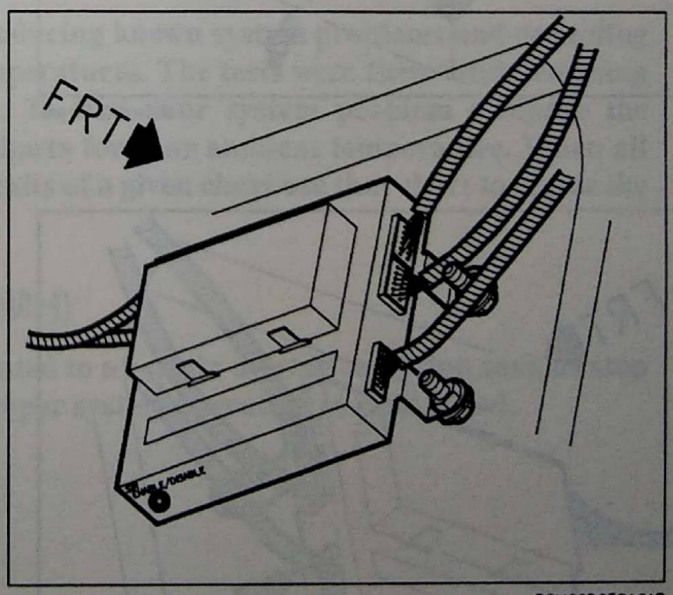
CAUTION: WHEN PERFORMING SERVICE ON OR AROUND SIR COMPONENTS OR SIR MIRING FOLLOW THE PROCEDURE BELOW TO TEMPORARILY DISABLE THE SIR SYSTEM. FAILURE TO FOLLOW PROCEDURES COULD RESULT IN POSSIBLE AIR BAG DEPLOYMENT, PERSON AL INJURY OR OTHERWISE UNNEEDED SIR SYSTEM REPAIRS.

THE SENSING AND DLAGNOSTIC MODULE (SDM) CAN MAINTAIN SUFFICIENT VOLTAGE TO CAUSE A DEPLOYMENT FOR UP TO *10 MINUTES* AFTER THE KEY PAD HAS BEEN PLACED IN THE "LOCK" MODE. ALSO IF THE AUXILIARY BATTERY IS DISCONNECTED OR THE SIR "ENABLE/DISABLE" SWITCH IS PLACED IN THE DISABLE POSITION. MANY OF THE SERVICE PROCEDURES REQUIRE THE SIR "ENABLE/DISABLE" SWITCH TO BE PLACED IN THE "DISABLE" POSITION AND DISCONNECTION OF THE DEPLOYMENT LOOPS TO AVOID AN ACCIDENTAL DEPLOYMENT.

< DISABLING THE SIR SYSTEM

1. Turn the steering wheel so that the vehicle's wheels are pointing straight ahead.
2. Place the key pad in the LOCK mode.
3. Place the SIR "ENABLE/DISABLE" switch in the right hand junction block in the DISABLE position.

IMPORTANT: With the SIR ENABLE/DISABLE switch in the DISABLE position and the key pad in the RUN mode, the AIR BAG telltale lamp will be "On." This is normal operation and does not indicate an SIR system malfunction.



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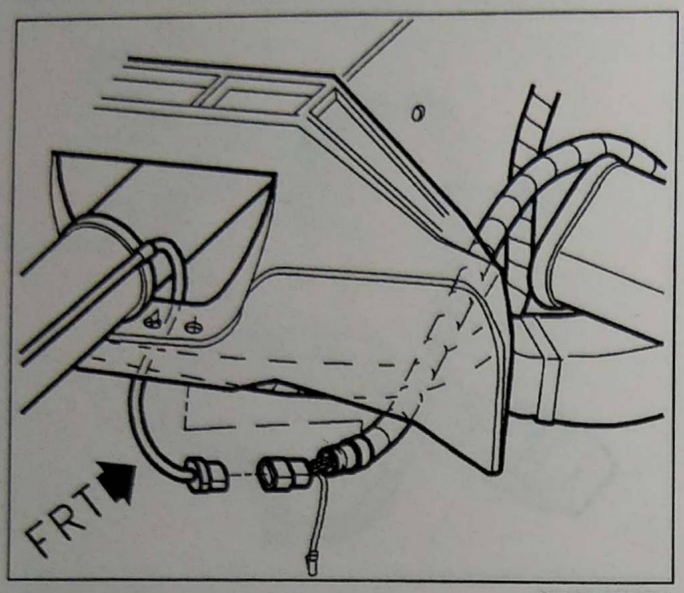

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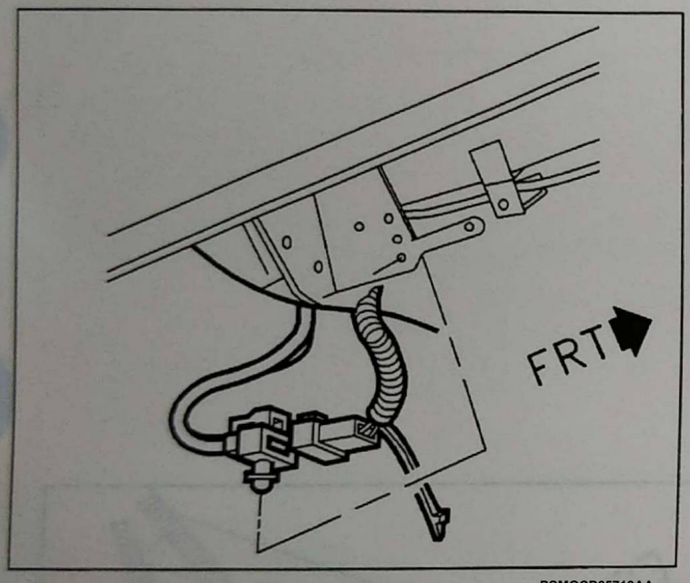
4. Remove connector position assurance (CPA) devj$_c$ and disconnect yellow two-way connector located ° near the base of the steering column.



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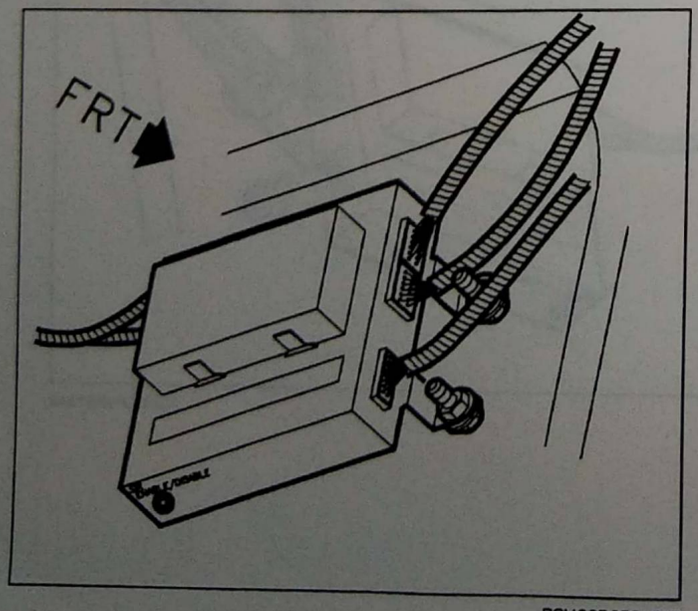
5. Remove connector position assurance (CPA) device and disconnect yellow two-way connector located on passenger inflator module pigtail under RH side of I/P.



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ENABLING THE SIR SYSTEM

1. Place key pad in the **LOCK** mode.
2. Connect yellow two-way SIR connector at the base of steering column and install connector position assurance (CPA) device to connector.
3. Connect yellow two-way passenger inflator module pigtail and install connector position assurance (CPA) to connector.
4. Place SIR **ENABLE/DISABLE** switch to the **ENABLE** position, located in the RH junction bio ck.
5. Place key pad in the "RUN" mode and verify that the AIR BAG telltale lamp flashes seven times a s the key pad is placed in the "RUN" mode and then goes Off. If lamp does not operate as described a o b ve perform the "SIR Diagnostic System Check i n this manual.

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HVAC INTRODUCTION

DIAGNOSTIC FLOW CHART

This chart is the starting point for verifying and diagnosing all air conditioning and HVAC control related complaints. It represents the correct path to follow from a customer complaint or condition through delivery of the vehicle.

PRELIMINARY CHECKS

This step covers all physical and visual inspections of interior and underhood components. Most problems can be detected by a thorough inspection. Failure to perform this step could result in wasted time and/or misdiagnosis. All preliminaiy checks must pass before proceeding further down the flow chart.

COMPLAINT-CONDITION TABLES

These tables will direct you to the appropriate service manual section based on conditions found during the preliminary checks. All information necessary to repair or replace a component is included in that components section.

VEHICLE SET UP/PERFORMANCE TEST

To run an air conditioning performance test the vehicle must be set-up according to the service manual instructions. The instructions include manifold gauge set installation and controller settings. Improper vehicle set up will results in inaccurate pressure and temperature readings.

GENERAL AND SPECIFIC SYSTEM CONDITION CHARTS

These charts were developed in a wind tunnel by producing known system problems and recording pressures and temperatures at various ambient temperatures. The tests were then validated using the same vehicle setup in a service environment. To find your system problem compare the performance test readings to the readings on the charts for your ambient temperature. When all pressure and temperature readings fall within the limits of a given chart use that chart to repair the vehicle.

PERFORMANCE TEST AT 45 MPH (72 KMH)

Perform this test when a customers complaint is related to a certain driving condition such as stop and go traffic on a hot sunny day. This will verily proper system operation at road speed.

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FASTENER USAGE

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger), with the same protective coating may be used. Fasteners that cannot be reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require them. If the above conditions are not followed, parts or system damage could result.

Many fasteners are metric. Metric fasteners may be close in dimension to well-known English fasteners in the inch system. Replacement fasteners must be the correct nominal diameter, thread pitch and strength.

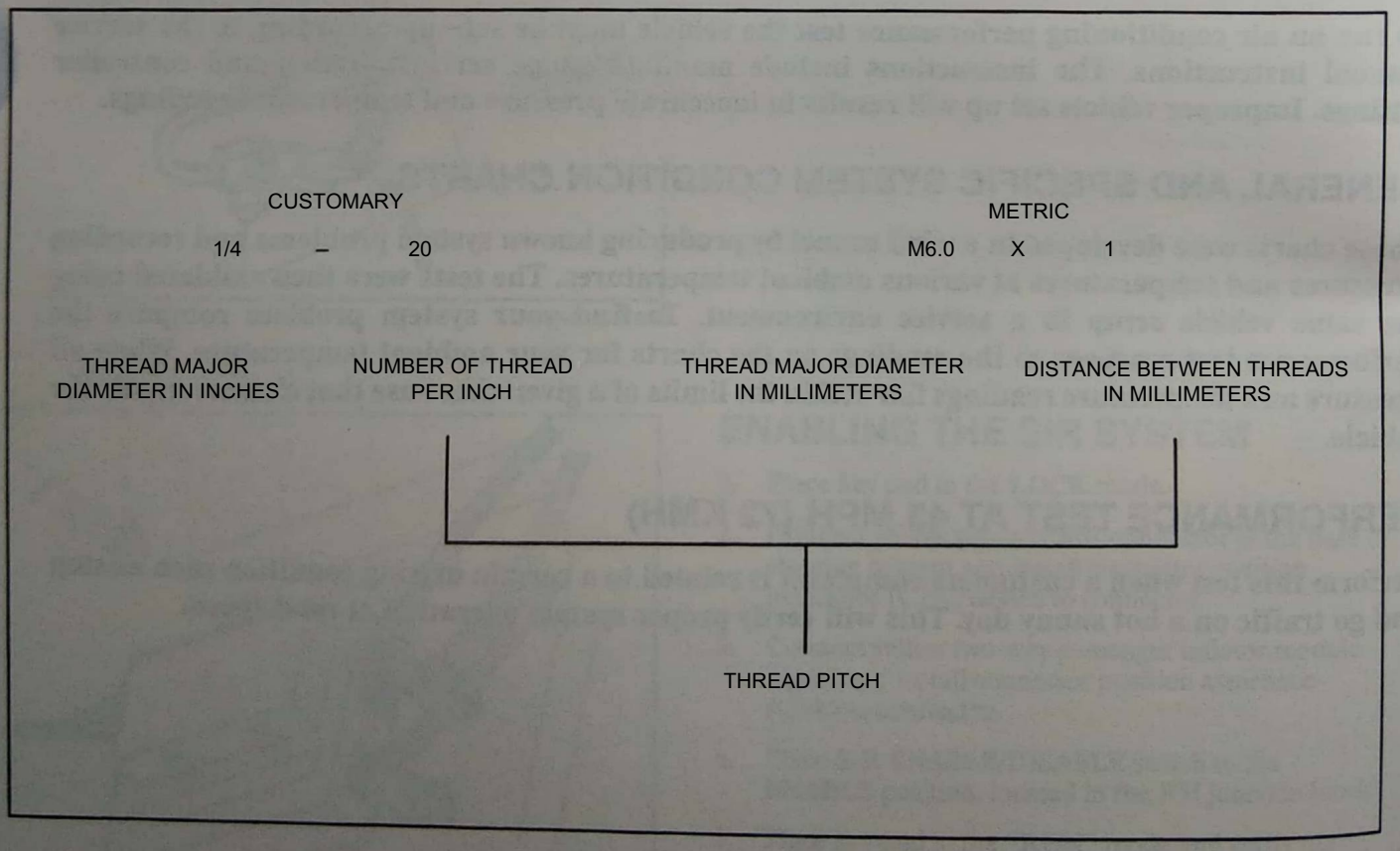
Original equipment metric fasteners, except for exposed bumper bolts and other beauty bolts and cross-recess head screws, have numbers on their heads that can be identified by a Posidriv or a Type 1A cross-recess. Either type of cross-recess screwdriver can be used to remove Posidriv recess head screws, but Type 1A will perform better.

NOTICE: Most metric fasteners have a blue color coating. This coating should not be used to positively identify fasteners because not ail metric fasteners are color-coated. Damage to the fastener or part could result if a English fastener is incorrectly used to replace a metric fastener.

Metric and English thread notations differ slightly. For example, the thread major diameter of a 1/4-20 bolt/screw is 1/4 inch, and the bolt /screw has 20 threads per inch. The thread major diameter of an M6.0xl bolt/screw is 6.0 mm, and the bolt/screw has a 1 mm between threads.

Many aluminum components are used on present GM models. Aluminum in contact with steel may corrode rapidly if not protected by special finishes or isolators. There are three special finishes which meet GM specifications; they are GM 6111-M (gray), GM 6047 (black) or GM 6147-M (black). These special fasteners differ in color from the standard metric fasteners, which are medium blue, in order to make them easily identifiable.

NOTICE: When replacing fasteners avoid substituting otherwise similar fasteners in locations which require the use of GM 6111-M, GM 6047, or GM 6147-M type special fasteners for aluminum components. Failure to follow this precaution may result in premature corrosion of sheet metal or fastener.



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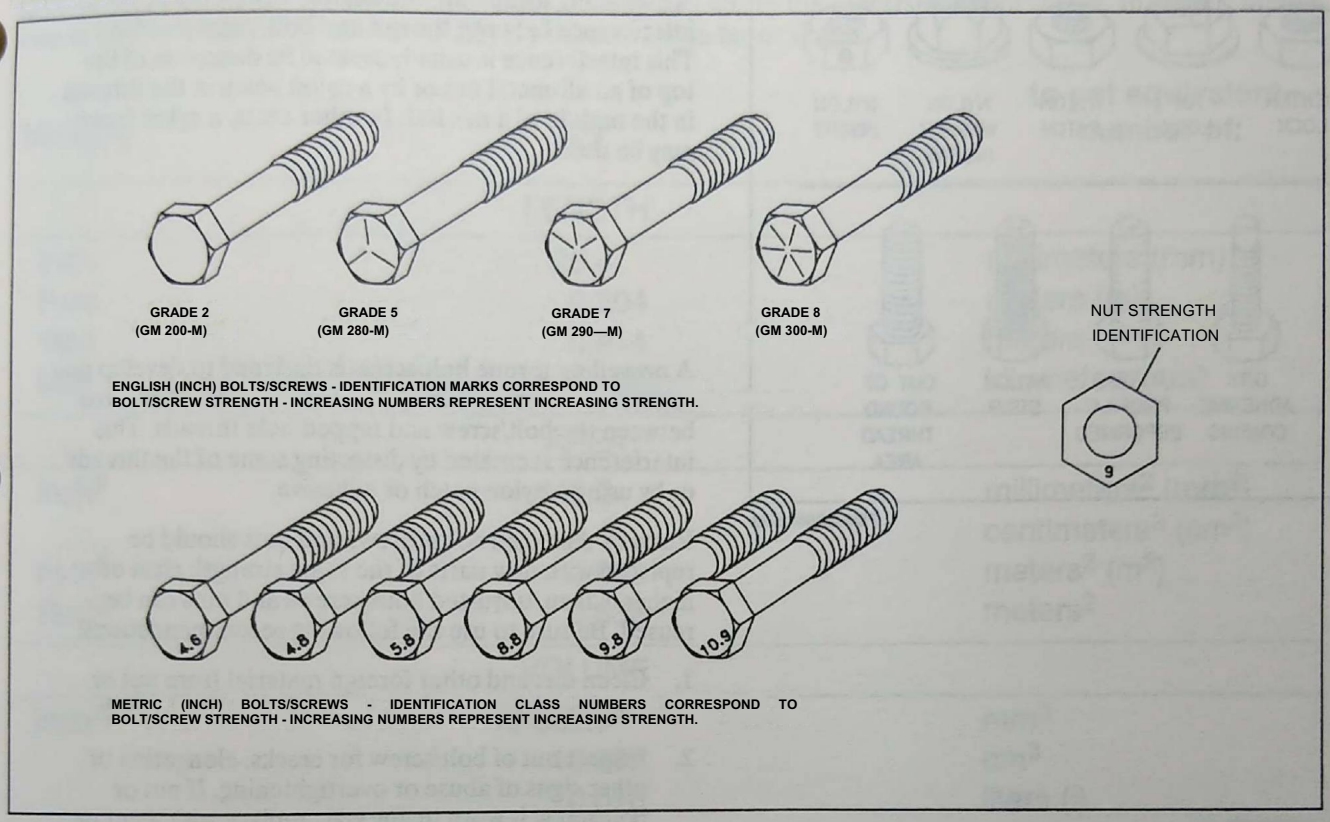
FASTENER STRENGTH IDENTIFICATION



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Most commonly used metric fastener strength property classes are 9.8 and 10.9. The class identification is embossed on the head of each bolt/screw. English fastener strength property classes range from grade 2 to 8. Radial lines are embossed on the head of each bolt/screw to identify the strength class. Some metric nuts are marked with strength identification numbers on the nut face.

When replacing fasteners, be careful to use bolts/screws and nuts of a strength class equal to, or higher than, the original fasteners (the same number marking or higher).

Also select replacement fasteners of the correct size. Correct replacement bolts/screws and nuts are available through Saturn Service Parts Operation (SSPO).

Many metric fasteners available in the aftermarket parts channels were designed to metric standards of countries other than the United States. The fasteners may have different strength or thread pitch and may not have the numbered head marking system. The metric fasteners used on GM products are designed to new international standards that might not be used by some nondomestic bolt/screw and nut suppliers.

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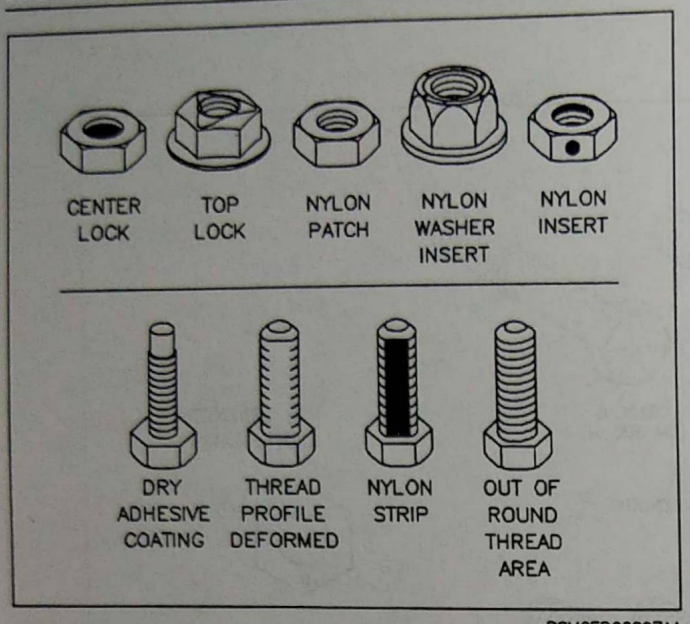

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PREVAILING TORQUE FASTENERS

A prevailing torque nut is designed to develop a interference between the nut and bolt/screw threads. This interference is usually created by distortion of the top of an all-metal nut or by a nylon patch in the threads in the middle of a hex flat. In other cases, a nylon insert may be used.

A prevailing torque bolt/screw is designed to develop an interference between the bolt/screw and nut threads or between the bolt/screw and tapped hole threads. This interference is created by distorting some of the threads or by using a nylon patch or adhesive.

Rusty or damaged bolts/screws and nuts should be replaced with new parts of the same strength class or higher. Clean, unrusted bolts/screws and nuts can be reused. Be sure to use the following recommendations:

1. Clean dirt and other foreign material from nut or bolt/screw.
2. Inspect nut of bolt/screw for cracks, elongation or other signs of abuse or overtightening. If nut or bolt/screw is worn in any way, replace with a nut or bolt/screw of the same strength class or higher.
3. Assemble the parts and hand-start nut or bolt-screw.
4. Check that nut or bolt/screw fails to develop the proper torque before it seats. If nut or bolt/screw fails to develop torque correctly, replace with a nut or bolt/screw of the same strength class or higher.
5. Tighten fastener to the torque specified in the appropriate installation procedure in this manual.

FASTENER TYPE	TORQUE UNITS	METRIC-SIZE FASTENERS							
		6	6.3	8	10	12	14	16	20
NUTS AND ALL METAL BOLTS/SCREWS	N*m	0.4	0.4	0.8	1.4	2.2	3.0	4.2	7.0
	Lb. In.	4	4	7	12	19	27	37	62
ADHESIVE OR NYLON COATED BOLTS/SCREWS	N*m	0.4	0.4	0.6	1.2	1.6	2.4	3.4	5.6
	Lb. In.	4	4	5	11	14	21	30	50
FASTENER TYPE	TORQUE UNITS	INCH-SIZE FASTENERS							
		.250	.312	.375	.437	.500	.562	.625	.750
NUTS AND ALL METAL BOLTS/SCREWS	N*m	0.4	0.6	1.4	1.8	2.4	3.2	4.2	6.2
	Lb. In.	4	5	12	16	21	28	37	55
ADHESIVE OR NYLON COATED BOLTS/SCREWS	N*m	0.4	0.6	1.0	1.4	1.8	2.6	3.4	5.2
	Lb. In.	4	5	9	12	16	23	30	49

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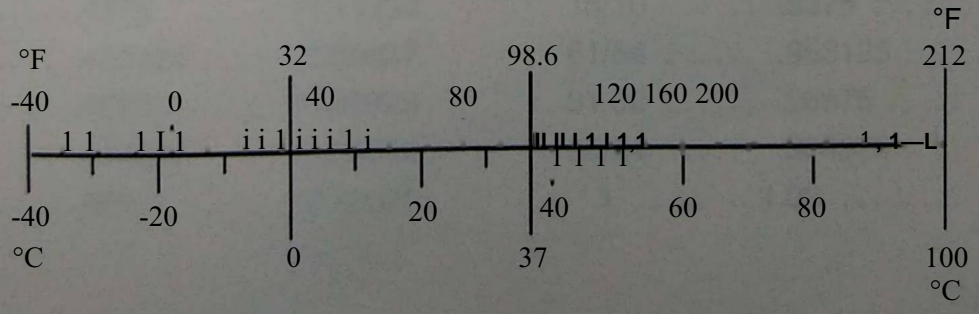
ENGLISH-METRIC CONVERSIONS

To convert English units to Metric units, multiply the English units by the conversion factor shown. To convert Metric units to English units, divide the Metric units by the conversion factor shown.

Multiply	by	to get equivalent number of:
	LENGTH	
Inch	25.4	millimeters (mm)
Foot	0.304	meters (m)
Yard	0.914	meters
Mile	1.609	kilometers (km)
	AREA	
Inch^2	645.2	millimeters^2 (mm^2)
	6.45	centimeters^2 (cm^2)
Foot^2	0.092	meters^2 (m^2)
Yard^2	0.836	meters^2
	VOLUME	
Inch^3	16 387.0	mm^3
	16.387	cm^3
	0.016	liters (1)
Quart	0.946	liters
Gallon	3.785	liters
Yard^3	0.764	meters^3 (m^3)
	MASS	
Pound	0.453	kilograms (kg)
Ton	907.18	kilograms (kg)
Ton	0.907	tonne (t)
	FORCE	
Kilogram	9.807	newtons (N)
Ounce	0.278	newtons
Pound	4.448	newtons
	TEMPERATURE	
Degree Fahrenheit (°F)	(°F-32) 1.8	Degree Celsius (C)



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ENGLISH-METRIC CONVERSIONS (CONTINIED)

Multiply	by	to get equivalent number of:
	ACCELERATION	
Foot/sec^2	0.305	meter/sec^2 (m/s^2)
Inch/sec^2	0.025	meter/sec^2
	TORQUE	
Pound-inch	0.113	newton-meters (N»m)
Pound-foot	1.356	newton-meters
	POWER	
Horsepower	0.746	kilowatts (kW)
	PRESSURE OR STRESS	
Inches of water	0.248	kilopascals (kPa)
Pounds/sq. in.	6.895	kilopascals
	ENERGY OR WORK	
BTU	1 055.	joules (J)
Foot-pound	1.356	joules
Kilowatt-hour	3 600 000. or 3.6 x 10^6	joules (1 joule = one watt-second)
	LIGHT	
Foot candle	10.76	lumens/meter^2 (lm/m^2)
	FUEL PERFORMANCE	
Miles/gal	0.425	kilometers/liter (km/l)
Gal/mile	2.353	liter/kilometer (l/km)
	VELOCITY	
Miles/hour	1.609	kilometers/hr. (km/h)

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DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal In	Metric MM	Fractions	Decimal In	Metric MM
1/64	.015625	39688	33/64	.51625	13.09687
1/32	.03125	79375	17/32	.53125	13.49375
3/64	.046875	1.19062	35/64	.546875	13.89062
1/16	.0625	1.58750	9/16	.5625	14.28750
5/64	.078125	1.98437	37/64	.578125	14.68437
3/32	.09375	2.38125	19/32	.59375	15.08125
7/64	.109375	2.77812	39/64	.609375	15.47812
1/8	.125	3.17500	5/8	.625	15.87500
9/64	.140625	3.57187	41/64	.640625	16.27187
5/32	.15625	3.96875	21/32	.65625	16.66875
11/64	.171875	4.36562	43/64	.671875	17.06562
3/16	.1875	4.76250	11/16	.6875	17.46250
13/64	.203125	5.15937	45/64	.703125	17.85937
7/32	.21875	5.55625	23/32	.71875	18.25625
15/64	.234375	5.95312	47/64	.734375	18.65312
1/4	.250	6.35000	3/4	.750	19.05000
17/64	.265625	6.74687	49/64	.765625	19.44687
9/32	.28125	7.14375	25/32	.78125	19.84375
19/64	.296875	7.54062	51/64	.796875	20.24062
5/16	.3125	7.93750	13/16	.8125	20.63750
21/64	.328125	8.33437	53/64	.828125	21.03437
11/32	.34375	8.73125	27/32	.84375	21.43125
23/64	.359375	9.12812	55/64	.859375	21.82812
3/8	.375	9.52500	7/8	.875	22.22500
25/64	.390625	9.92187	57/64	.890625	22.62187
13/32	.40625	10.31875	29/32	.90625	23.01875
27/64	.421875	10.71562	59/64	.921875	23.41562
7/16	.4375	11.11250	15/16	.9375	23.81250
29/64	.453125	11.50937	61/64	.953125	24.20937
15/32	.46875	11.90625	31/32	.96875	24.60625
31/64	.484375	12.30312	63/64	.984375	25.00312
1/2	.500	12.70000	1	1.00	25.40000

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LIFTING, JACKING, AND SUPPORT POINTS

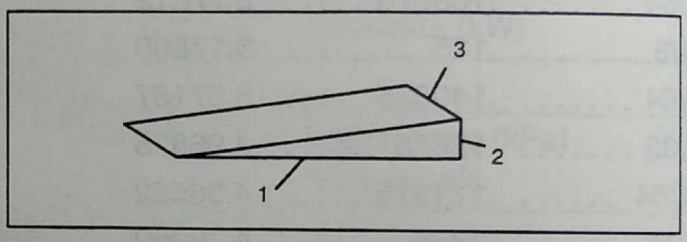
CAUTION: TO HELP AVOID PERSONAL INJURY WHEN A VEHICLE IS ON A HOIST, PROVIDE ADDITIONAT SUPPORT FOR THE VEHICLE. THIS WILL REDUCE THE POSSIBILITY OF THE VEHICLE FALLING OFF THE HOIST.

CAUTION: TO HELP AVOID PERSONAL INJURY, ALWAYS USE JACK STANDS WHEN WORKING ON OR UNDER ANT VEHICLE THAT IS SUPPORTED ONLY BY A FLOOR JACK OR A HOIST.

NOTICE: When lifting with a frame contact hoist, and battery pack removal is not necessary, lift the vehicle on the body side frame-lower pinch weld flanges at specific lift locations. (Location views on next page).

NOTICE: Because of the uniqueness of the design of the EVl and its ground clearance, it is necessary to follow the hoisting directions very carefully. With an inground two post front and rear hoist, it may be necessary to use either low profile arms or ramps as needed in the front lift pad area to keep the fascia from being damaged when approaching or leaving the hoisting area. Ramp size needed:

1. 1050 mm in length (41-3/8 in.)
2. 155 mm in height (6-7/64 in.)
3. 230 mm in width (9-1/16 in.)



NOTICE: When lifting with a suspension contact hoist, position the front hoist pads under the control arms. Lift from under the rear tires for rear suspension. (Refer to "Hoisting/Lifting for a Two Post In Ground Hoist Front and Rear" in this section for more information and illustrations.)

When battery pack removal is required, the use of two rear lift pad adaptors must be used. These lift pad adaptors are obtainable from:

General Motors Dealer Equipment

Telephone: 1-800-GM-TOOLS

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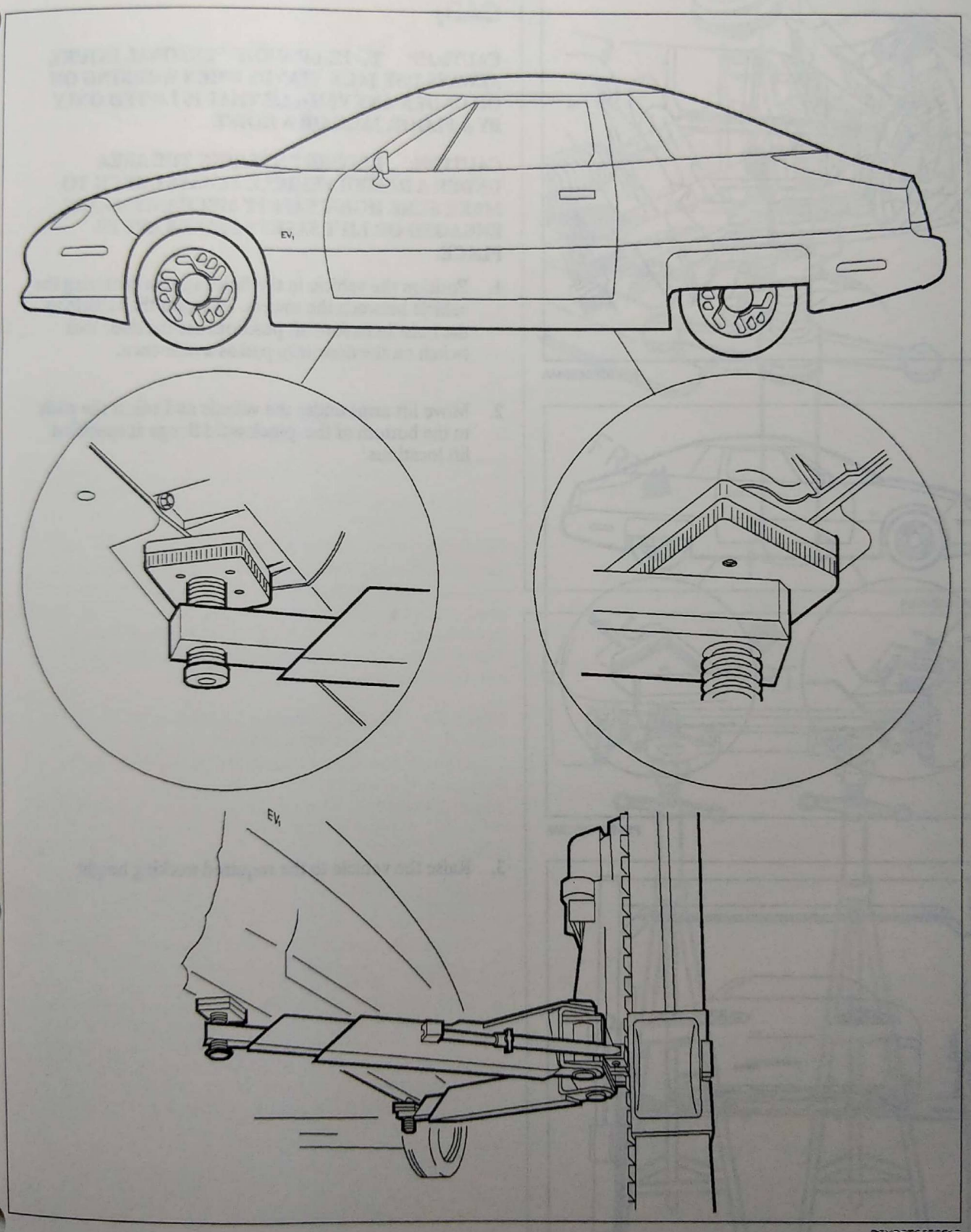
GENERAL INFORMATION



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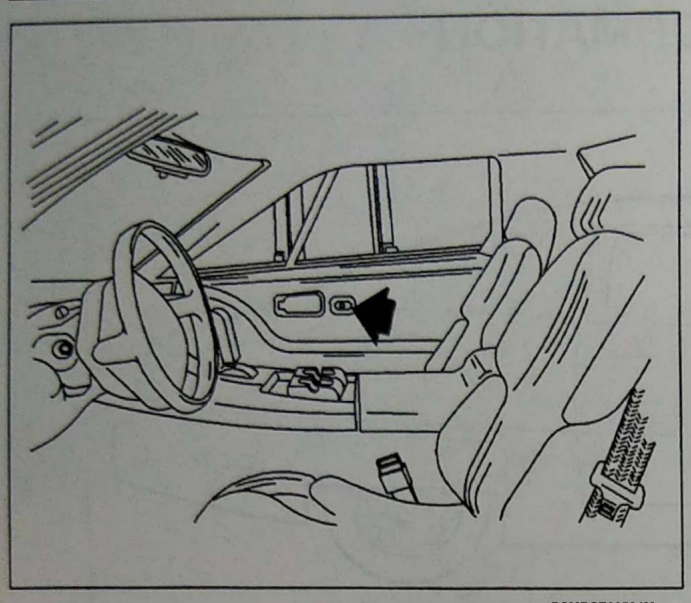

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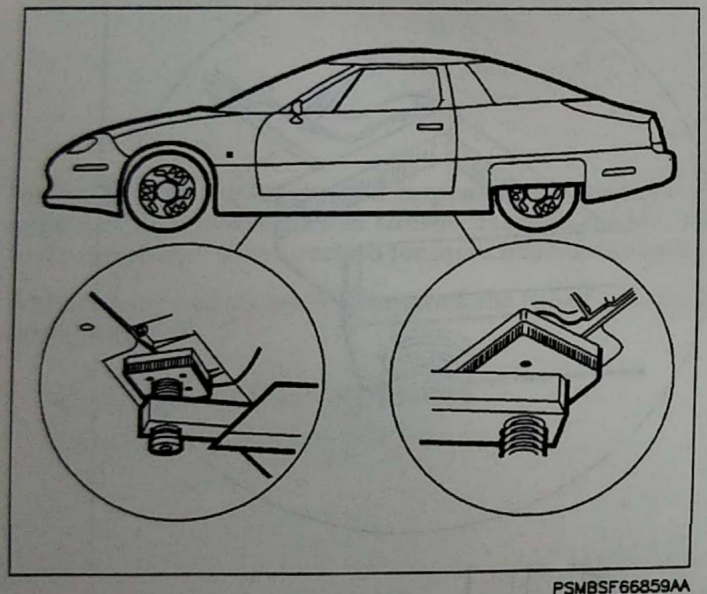

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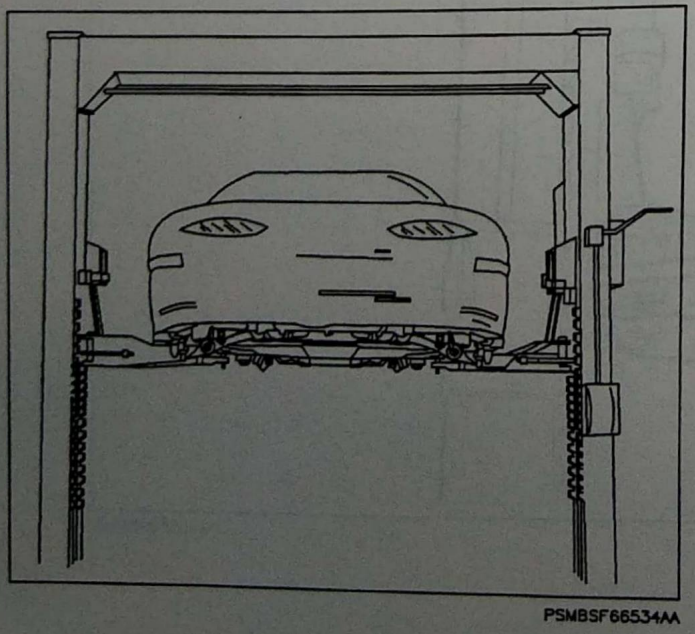

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HOISTING/LIFTING FOR A 2 POST ABOVE GROUND HOIST - (SIDE CAR)

CAUTION: TO HELP AVOID PERSONAL INJURY ALWAYS USE JACK STANDS WHEN WORKING ON OR UNDER ANY VEHICLE THAT IS LIFTED ONLY BY A FLOOR JACK OR A HOIST.

CAUTION: BEFORE ENTERING THE AREA UNDER A RAISED VEHICLE ALWAYS CHECK TO MAKE SURE HOIST SAFETY MECHANISMS ARE ENGAGED OR LIFT SAFETY STANDS ARE IN PLACE.

1. Position the vehicle in the hoisting area centering the vehicle between the towers. To center the vehicle to the hoist in its fore aft position, use the door lock switch on the door trim pad as a reference.

2. Move lift arms under the vehicle and adjust the pads to the bottom of the pinch weld flange at specified lift locations.

3. Raise the vehicle to the required working height

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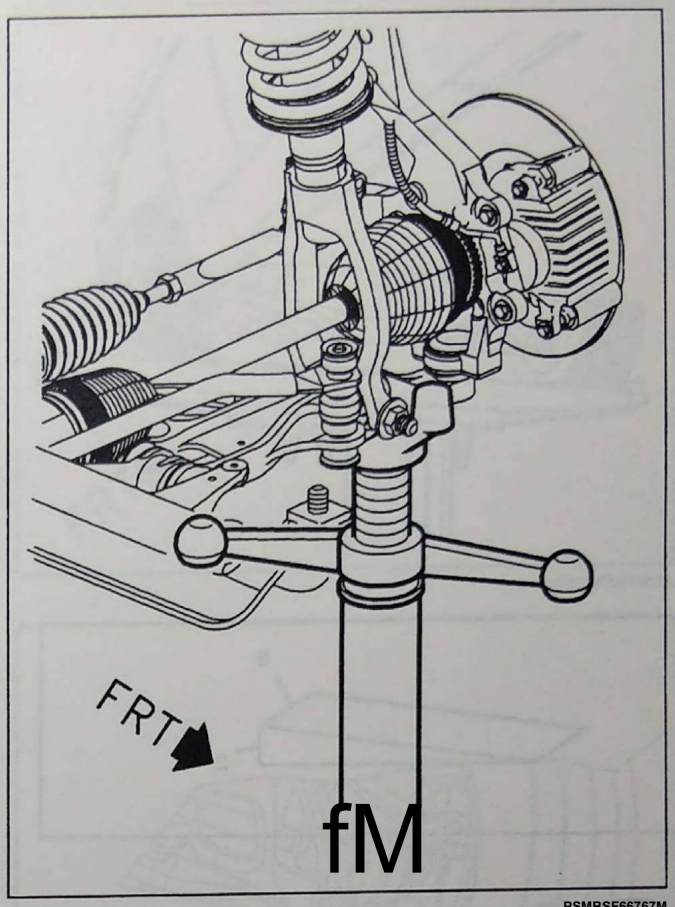
4 Position safety stands in place.



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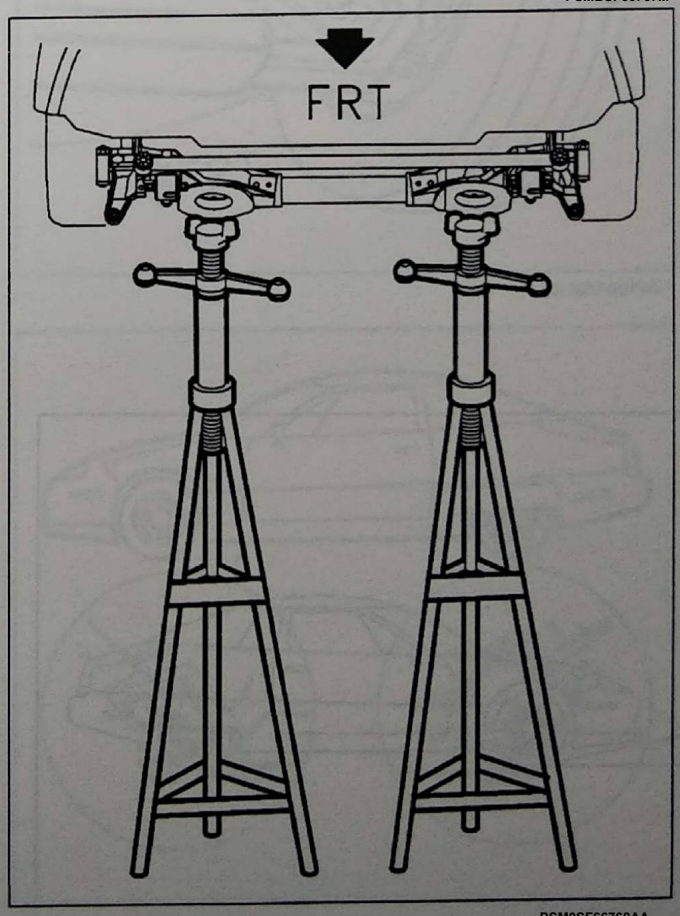

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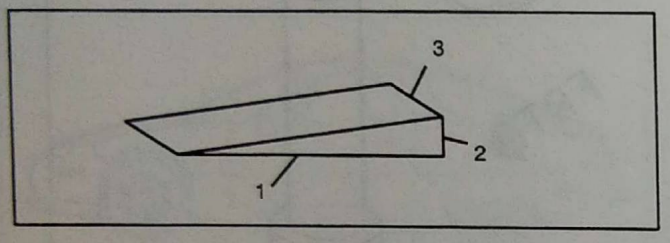
HOISTING/LIFTING FOR A 2 POST INGROUND HOIST - (FRONT AND REAR)

CAUTION: BEFORE ENTERING THE AREA UNDER A RAISED VEHICLE ALWAYS CHECK TO MAKE SURE HOIST SAFETY MECHANISMS ARE ENGAGED OR LIFT SAFETY STANDS ARE IN PLACE.

NOTICE: When using an in ground hoist it is necessary to pay close attention to the ground clearance at the front end of the vehicle. Be careful not to damage any of the front end components.

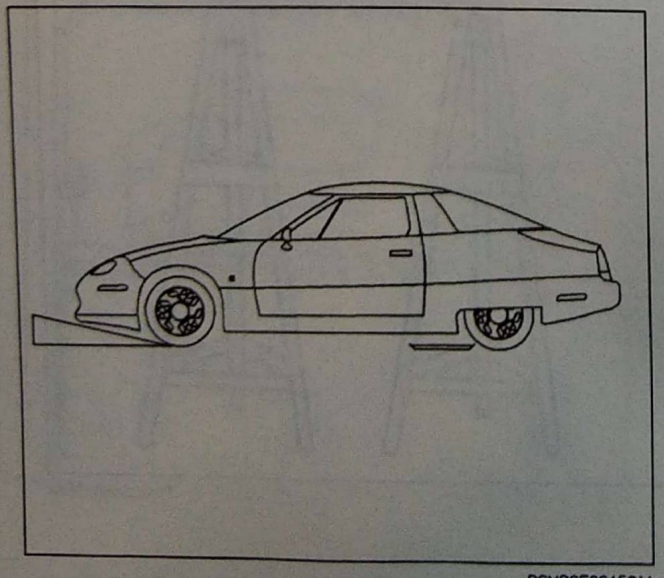
NOTICE: The aid of a ramp for some models of lifts is helpful for obtaining clearance under the front end of the vehicle. Proper clearance will keep the fascia and underbody components from being damaged when approaching or leaving the hoisting area. Ramp size needed:



1. 1050 mm in length (41-3/8 in.)
2. 155 mm in width (6-7/64 in.)
3. 230 mm in height (9-1/16 in.)

NOTICE: With the use of ramps, always have a partner who will be outside and in front of the vehicle guide and watch to ensure that proper alignment is achieved to the ramps and hoisting area. Be careful tha you don't drive over or slip off the edge of the ramps. Failure to do so could result in damage to under body and mechanical components.

NOTICE: The first vehicle to be lifted using the ramp method may take several attempts to get properly aligned to the hoist pads under the front of the body structure. Marking the floor with tape, paint or permanent marker after the ramp position is determined will aid in the positioning ramps for future EVl vehicle lifting.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1. Drive the vehicle up to the hoisting area, centering the vehicle to the hoist in its side to side position.
2. Drive vehicle forward until the front of the rear tires contact the rear edge of the rear tire lift tray.
3. Place the ramps on the floor. In front of the vehicle, center each ramp in front of the front tires.
4. Slide ramps rearward until they touch the front of the front tires, or align ramps to markings on floor made from previous lifting as described in the above "NOTICE."

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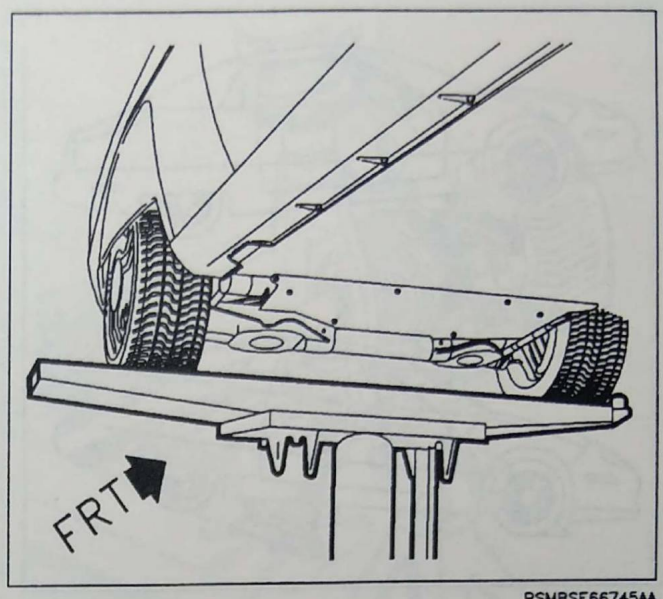
5 Drive forward and up the ramps until the rear tires are centered in the rear tire tray portion of the hoist.



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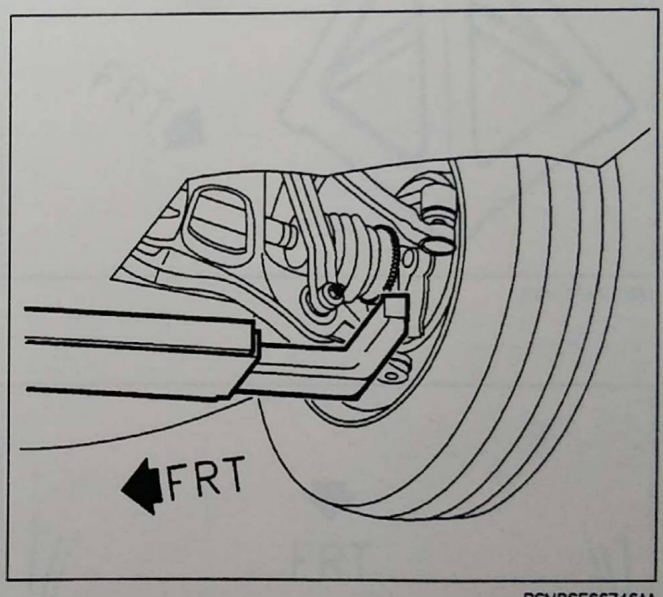
6. Put the front lift pads under the vehicle's front lower control arms at the portion between the ball joint and the yoke.
7. Lift the vehicle to proper working height and position safety stands. (Refer to "Lifting, Jacking, and Support Points" and "Hoisting Lifting with a Floor Jack" sections in this section.)



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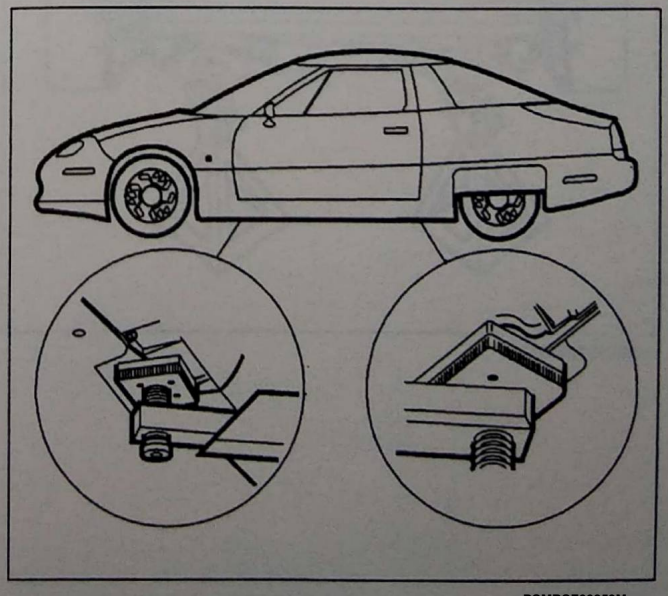
LIFTING WITH A FLOOR JACK

NOTICE: Do not put floor jack under any portion of the vehicle other than locations shown or damage to the structure may occur.

L Locate the rocker panel pinch weld flange lift/hoist areas, place floor jack in position, seat the lift pad in place, and chock the wheels. (Refer to "General Information" in the "Lifting, Jacking, and Support Points" section in this section.)



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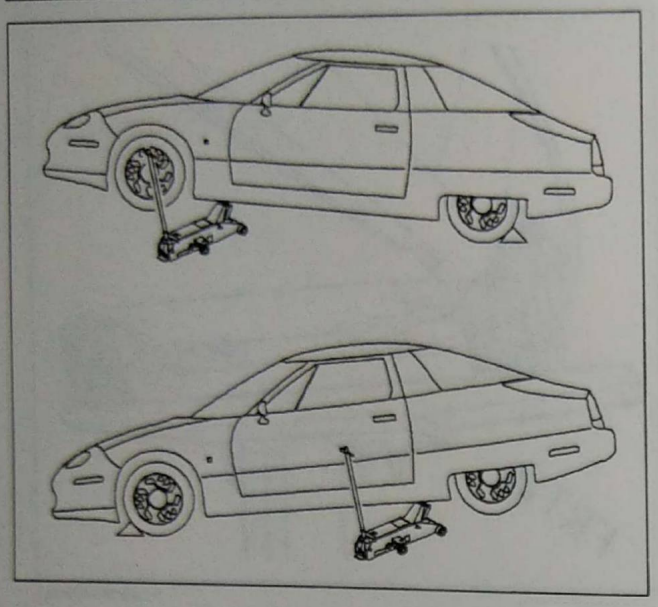

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CAUTION: TO HELP AVOID PERSONAL INJURY ALWAYS USE JACK STANDS WHEN WORKING ON OR UNDER ANY VEHICLE THAT IS LIFTED BY A FLOOR JACK OR A HOIST.

2. Lift vehicle with floor jack.

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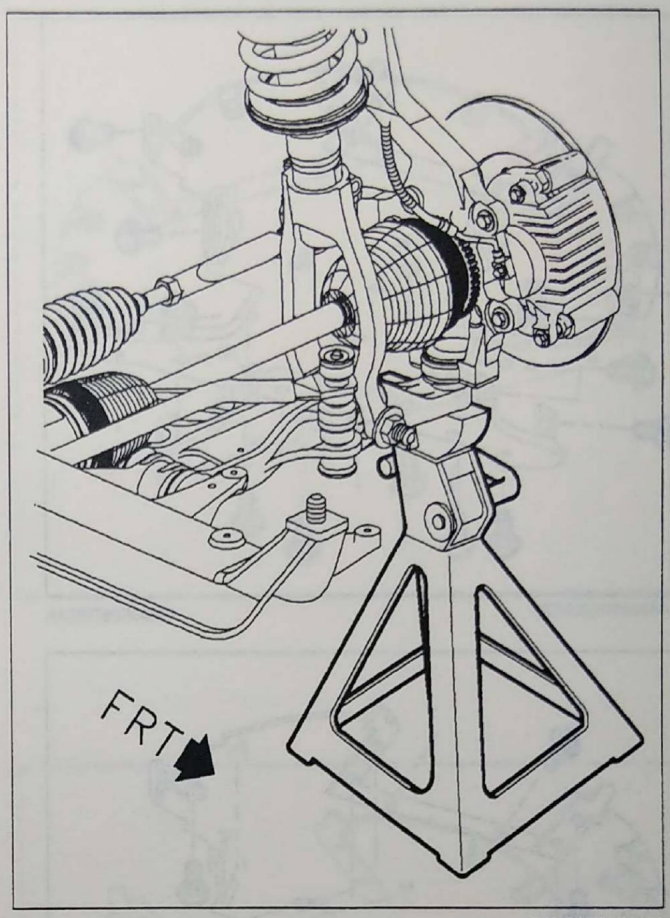
3 Once the vehicle is at the required working height install safety stands.



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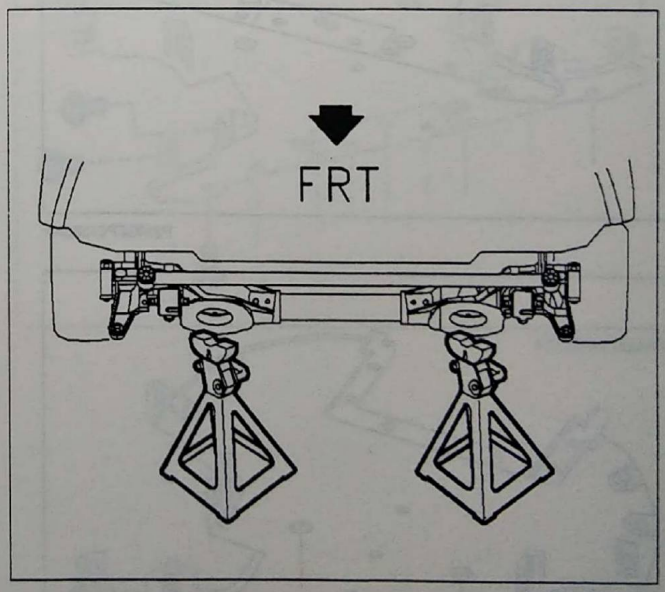

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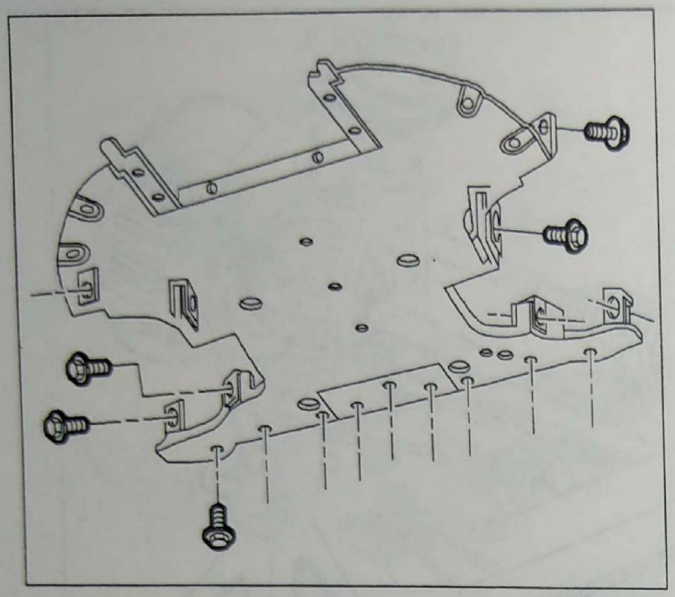
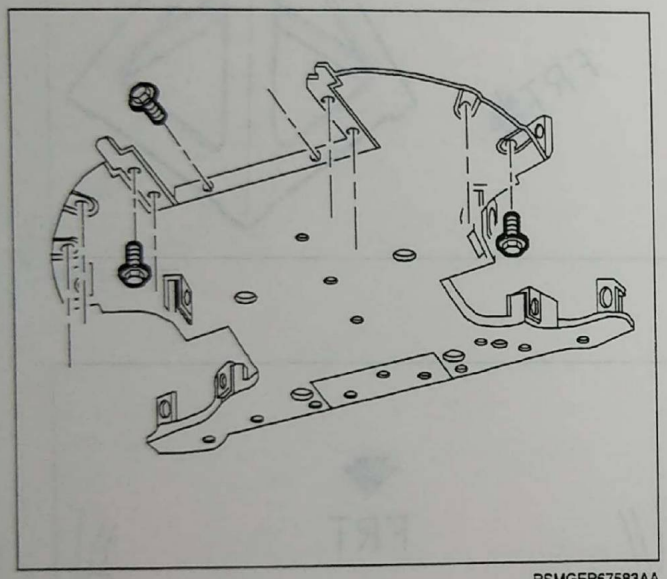


PSMGEP67582AA

UNDERBODY FRONT AIR DEFLECTOR

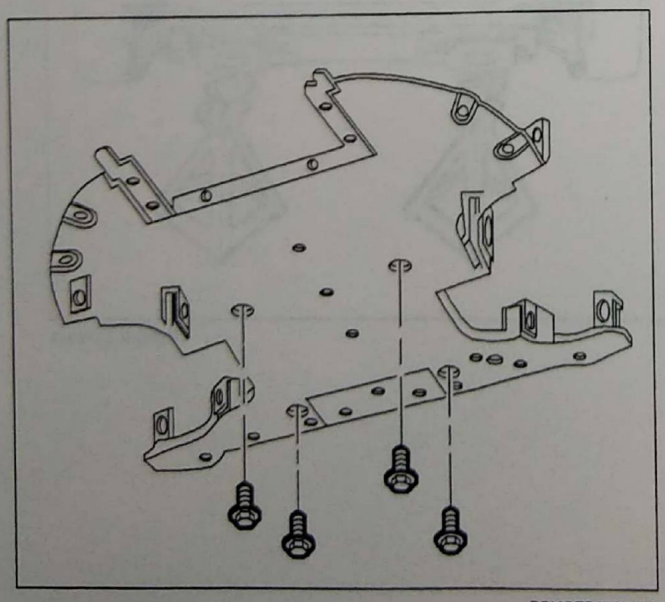
REMOVAL

1. Raise vehicle on hoist. (Refer to "Lifting, Jacking, and Support Points" section in this manual.)
2. Remove bolts retaining underbody front air deflector to underbody center air deflectors.
3. Remove bolts retaining underbody front air deflector to front wheelhouse panel liners.



PSMGEP67583AA

4. Remove bolts retaining underbody front air deflector to front bumper fascia assembly.
5. Remove bolts retaining underbody front air deflector to condenser radiator fan module (CRFM) bracket.
6. Remove bolts retaining underbody front air deflector to side baffles.



PSMGEP67581AA

7. Remove bolts retaining underbody front air deflector to drivetrain and front suspension crossmember assembly.
8. Lower underbody front air deflector and disengage tabs from front bumper fascia assembly.

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INSTALLATION

IMPORTANT: If bolt threads or “J" nuts threads are damaged during removal or installation, remove bolt and fastener, inspect, and replace if necessary.

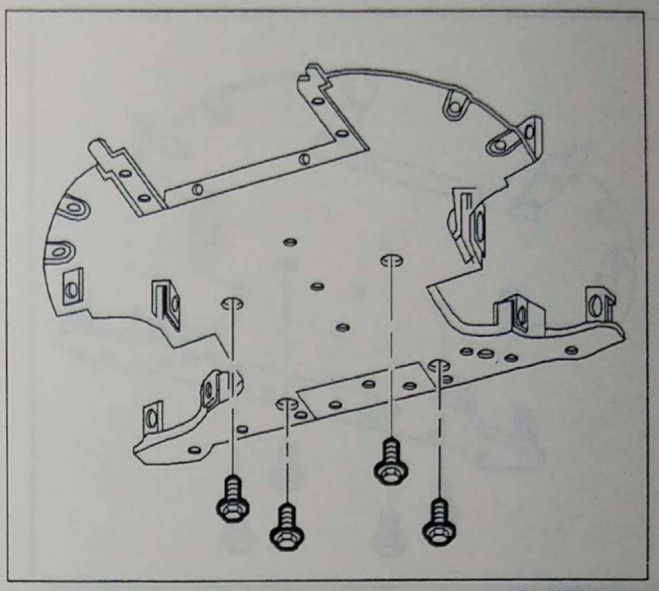
1. Raise front edge of air deflector and engage tabs into retaining slots on front bumper fascia assembly.
2. Raise and support underbody front air deflector to underside of vehicle.

IMPORTANT: Flange on air deflector must be located forward of condenser radiator fan module (CRFM) bracket.

3. Loosely install bolt retaining air deflector to CRFM bracket.
4. Loosely install bolts retaining underbody front air deflector to front mounting locations of drivetrain and front suspension crossmember assembly.
5. Loosely install bolts retaining underbody front air deflector to rear mounting locations of drivetrain and front suspension crossmember assembly.
6. Install and tighten bolts retaining underbody front air deflector to underbody center air deflectors. Torque as specified.

Torque: 6 N*m (53 in-lbs)

IMPORTANT: If cradle bolt begins to cross thread during installation, stop immediately, remove bolt, then run thread tap (M6.0 mm x 1.0) into insert to repair damaged threads.



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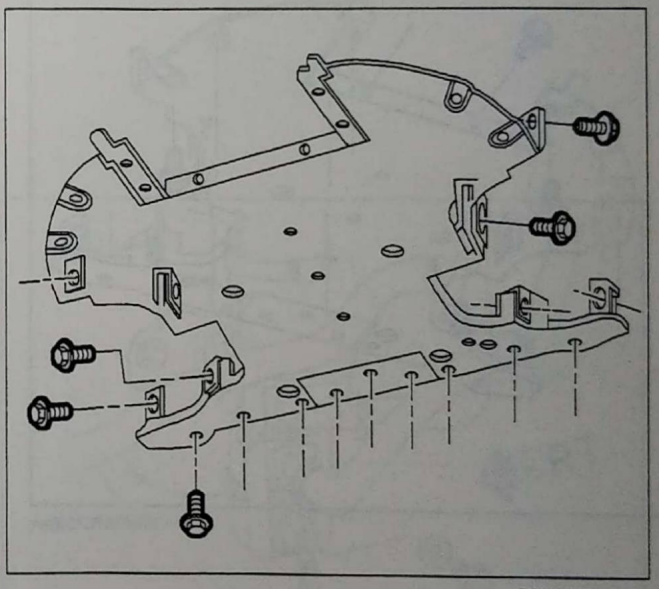

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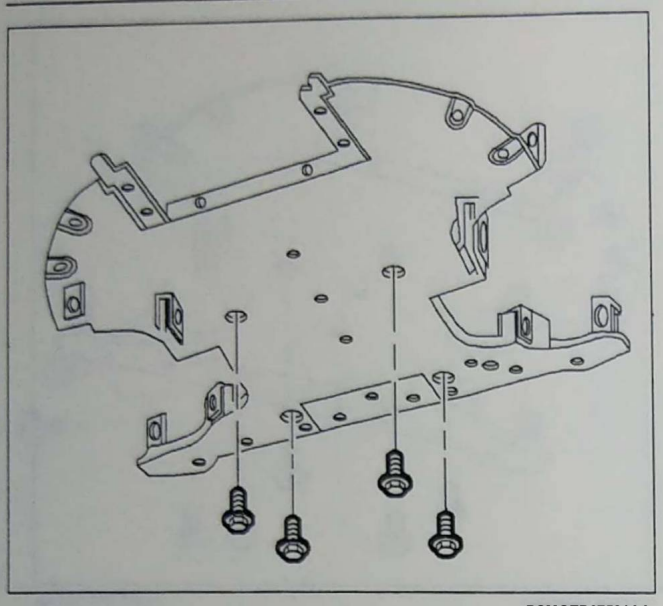
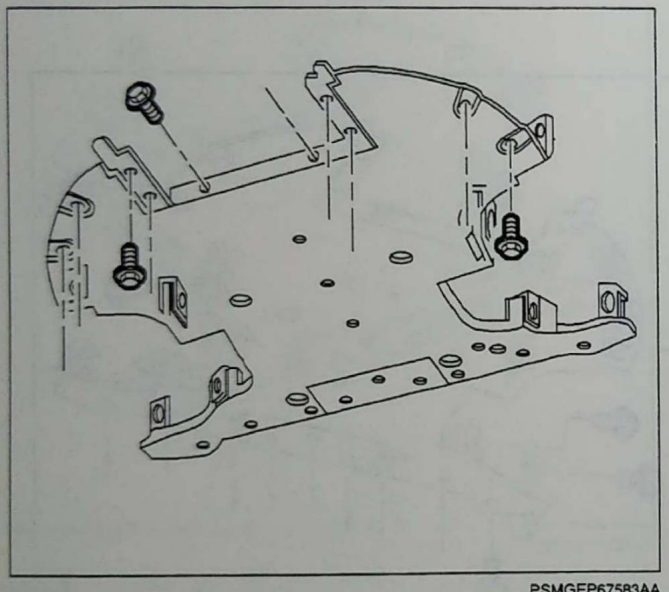


PSMGEP67581AA

7. Tighten bolts retaining underbody front air deflector to front mounting locations of drivetrain and front suspension crossmember assembly. Torque as specified.

Torque: 6 N*m (53 in—lbs)



PSMGEP67583AA

IMPORTANT: At CRFM attachment, position air deflector flange so that it rests up against the bottom of the CRFM lower support.

8. Install and tighten bolt retaining underbody front air deflector to CRFM bracket. Torque as specified.

Torque: 6 N*m (53 in-lbs)

9. Tighten remaining bolt retaining air deflector to CRFM bracket. Ensure underbody front air deflector/ is up against bottom of CRFM lower support. Torque as specified.

Torque: 6 N*m (53 in-lbs)

10. Install and tighten bolts retaining underbody front air deflector to CRFM to fascia close-out side baffles. Torque as specified.

Torque: 6 N*m (53 in-lbs)

11. Install and tighten bolts retaining underbody front air deflector to front bumper fascia assembly. Torque as specified.

Torque: 6 N*m (53 in-lbs)

12. Install and tighten bolts retaining underbody front air deflector to front wheelhouse panel liner on one side of the vehicle. Front tires may need to be rotated to access mounting locations. Torque as specified.

Torque: 6 N*m (53 in-lbs)

13. Install and tighten bolts retaining underbody front air deflector to front wheelhouse panel liner on opposite side of the vehicle. Front tires may need to be rotated to access mounting locations. Torque as specified.

Torque: 6 N*m (53 in-lbs)

14. Lower vehicle and turn front wheels to face in a straight ahead position.

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POWER ELECTRONICS BAY (PEB)

REMOVAL

CAUTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS. THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANYTIME SERVICE WORK IS BEING PERFORMED ON OR AROUND THE HIGH VOLTAGE SYSTEM. WHEN IN DOUBT. ALWAYS DIS ABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DISABLED.

1. Disable high voltage. (Refer to “High Voltage Disable” in this manual.)
2. Disable 12 volt system. (Refer to “12 Volt System Disable” in this manual.)

IMPORTANT: Do not remove expansion tank cover or open cooling system drains from a hot system. Allow system to cool first.

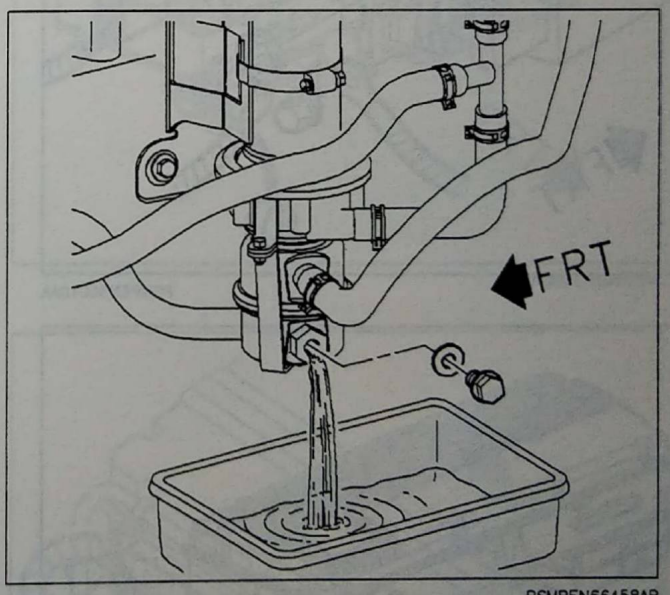
3. Remove the expansion tank cover.
4. Raise the vehicle on a hoist. (Refer to “Lifting, Jacking, and Hoisting” section in this manual.)
5. Remove front underbody air deflector. (Refer to “Front Underbody Air Deflector Removal” procedure in this manual.)
6. Position drain pan under water pump manifold.

IMPORTANT: A two gallon container will be required to hold the coolant.

7. Remove the drain plug and gasket from the water pump manifold allowing the coolant to flow from the main path.
8. After coolant has drained from the main path, reinstall water pump manifold drain plug and gasket.

Torque: 11 N*m (97 in-lbs)

9. Lower vehicle.



PSMPEN66458AB

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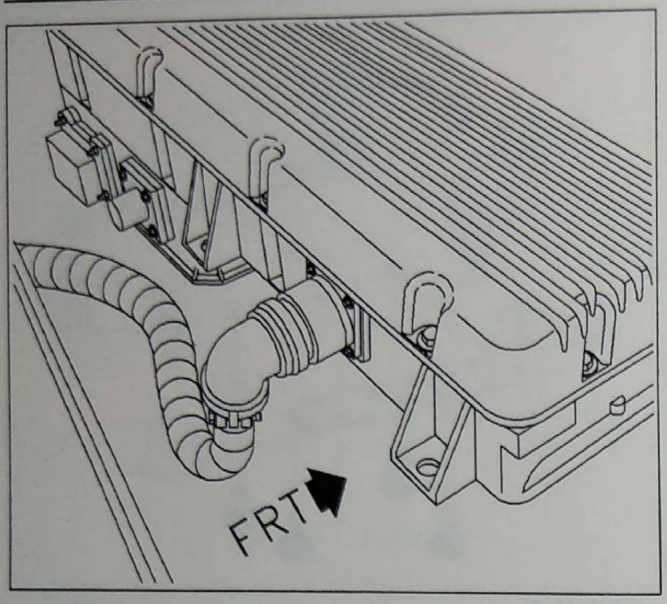
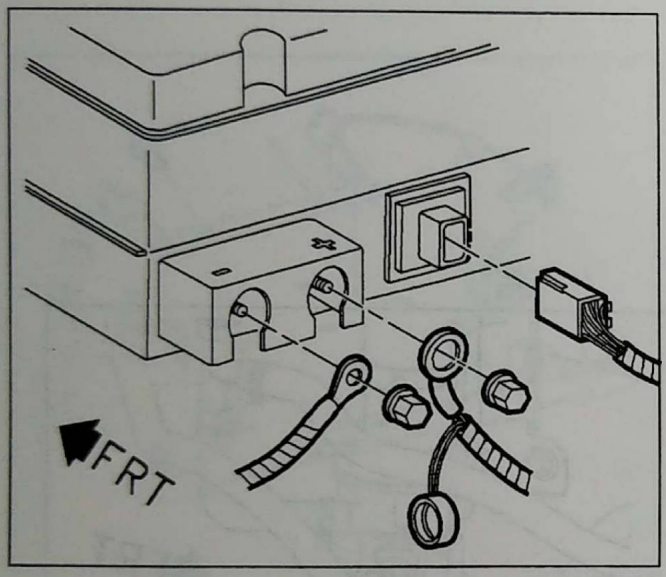


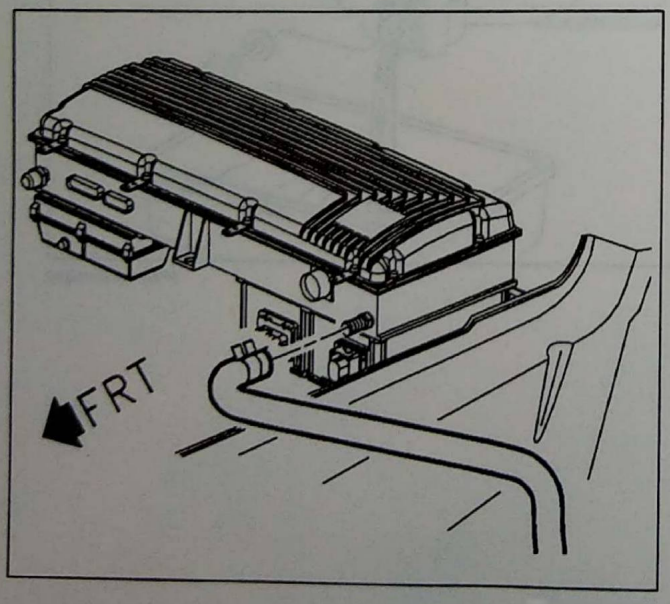
PSMPEN66279AA

10. Disconnect the battery assembly to power inverter module (PIM) cannon connector from the right rear corner of the PEB.



PSMPEN66019AA

11. Disconnect the accessory AC and DC power control module (APM) 5-way connector from the rear of the PIM.
12. Remove the negative and positive battery cables from the PIM. Voltage should not be present at these connections. If voltage is present verify that all steps of low and high voltage disable have been completed.

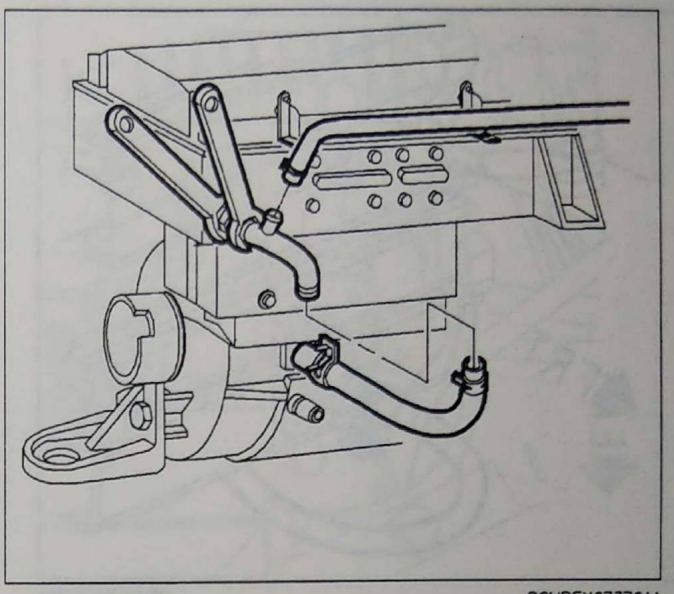


PSMPEN66020M

13. Disconnect the driver side coolant hose from the PIM.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, fittings or components

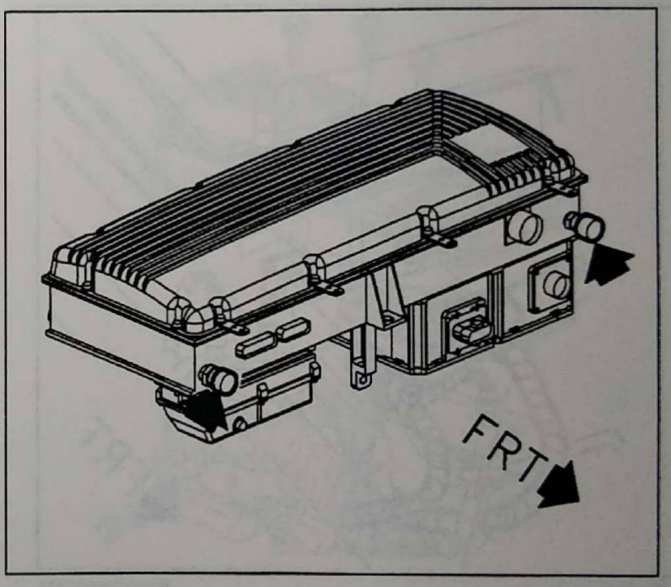
14. Disconnect the passenger side coolant hose from PIM only.



PSMPEN67370AA

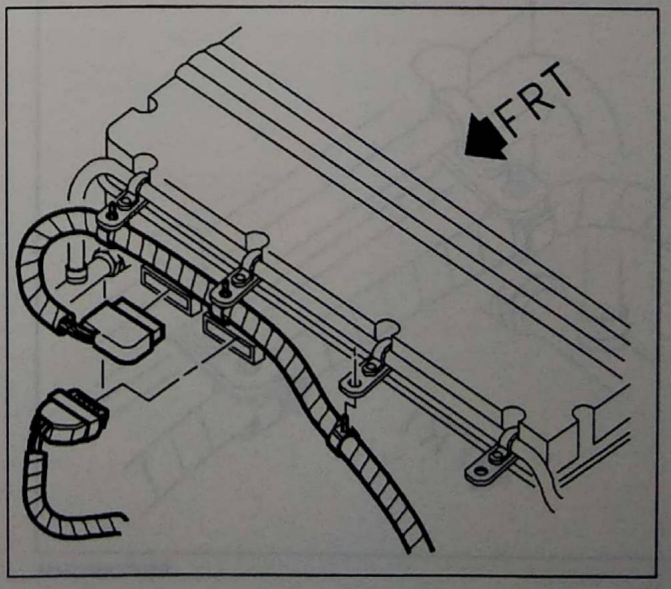
15. Install coolant plugs to prevent coolant leakage during removal.

IMPORTANT: If coolant plugs are not available, tape the cooling fittings.



PSMPEN65996M

16. Remove the 32—way and the 24—way connectors at the forward right corner of the PIM. To remove the connectors squeeze the connector retainer and pull outward.



PSMPEN66075M

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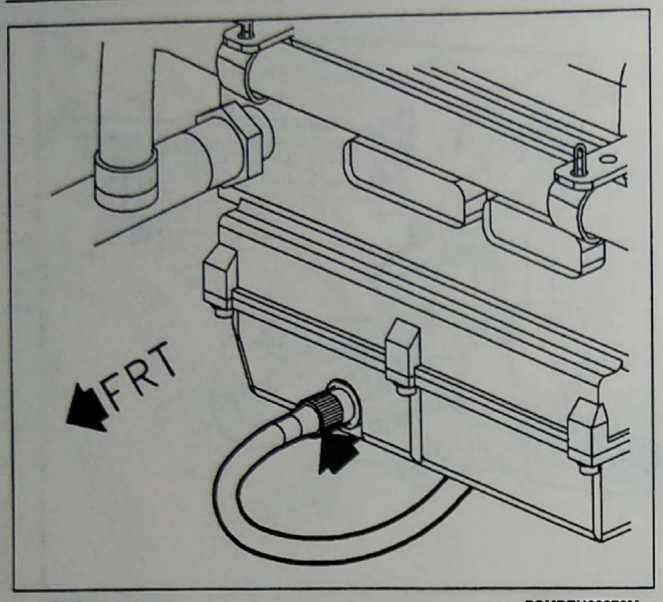
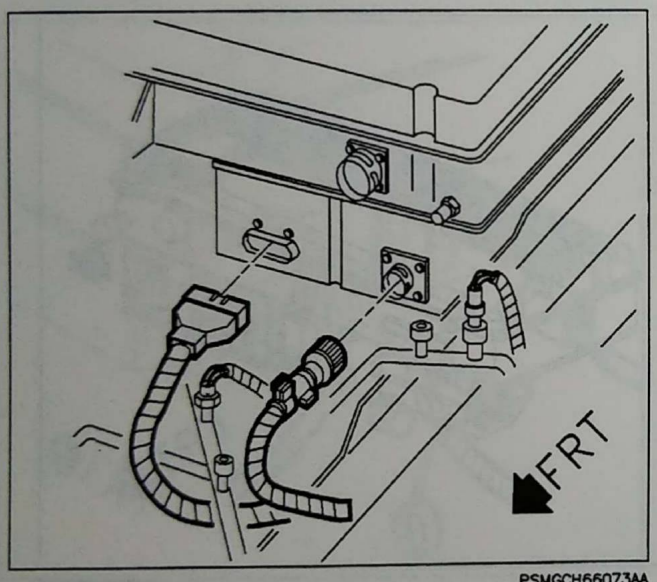


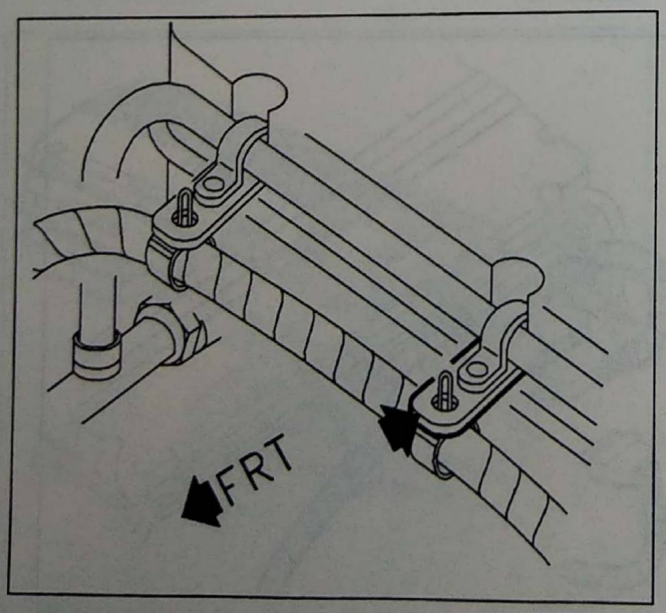
PSMPEN66270M

17. Disconnect the power steering control module (PSCM) 5-way connector at the PSCM.



PSMGCH66073AA

18. Disconnect the accessory AC and DC power control module (APM) 24−way and small cannon connector at the forward left side of the APM.



PSMPEN66074AA

IMPORTANT: Do not remove the PIM top cover screws.

19. Remove the wire clips retaining the PEB harness to the front PIM cover brackets and remove the PEB harness away from the PEB.

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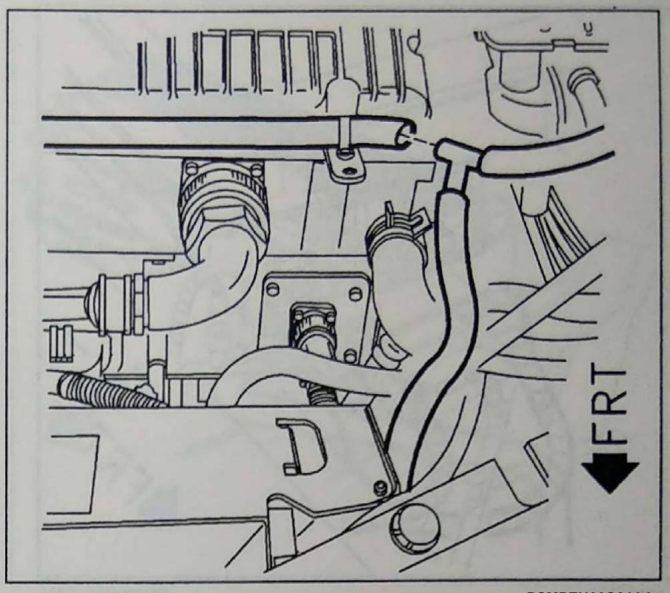
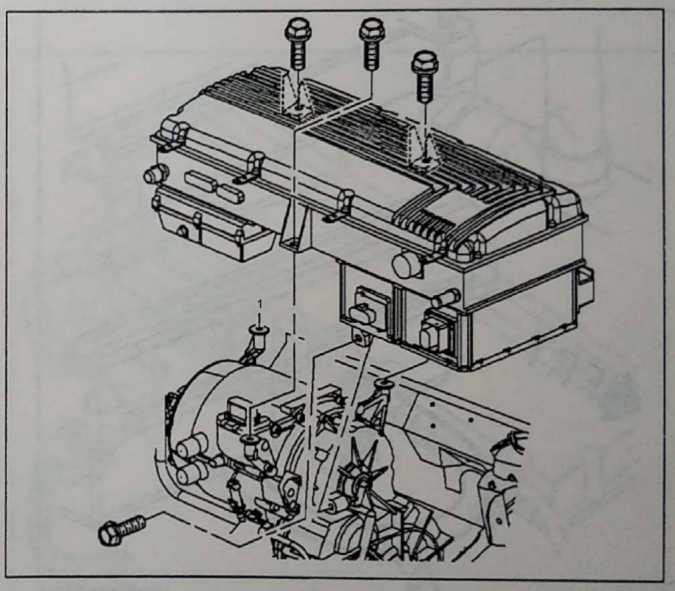
20. Remove the coolant hose at the “T” going into the expansion tank.



PSMPEN66O21AA

21. Remove the lower PEB to drive unit bolt located just to the right of the PEB center, below the top of the engine strut.
22. Remove the remaining PEB to drive motor bolts.
23. Using two people, one at each end of the PEB lift the assembly straight up disconnecting it from the drive motor and continue lifting until the lower attachment tab clears the front of vehicle. Remove the PEB.



PSMPEN65834AB

INSTALLATION

1. Using two people position the PEB over the drive motor connection point. Carefully lower the PEB over the drive motor and into position.
2. Install the top PEB to drive motor bolts. Lightly tightened all bolts.
3. Install the lower PEB to drive motor bolt located just to the right of the PEB center, below the top of the engine strut.

Torque: 35 N*m (26 ft-Ibs)

4. Torque the top PEB to motor bolts

Torque: 63 N*m (46 ft-lbs)

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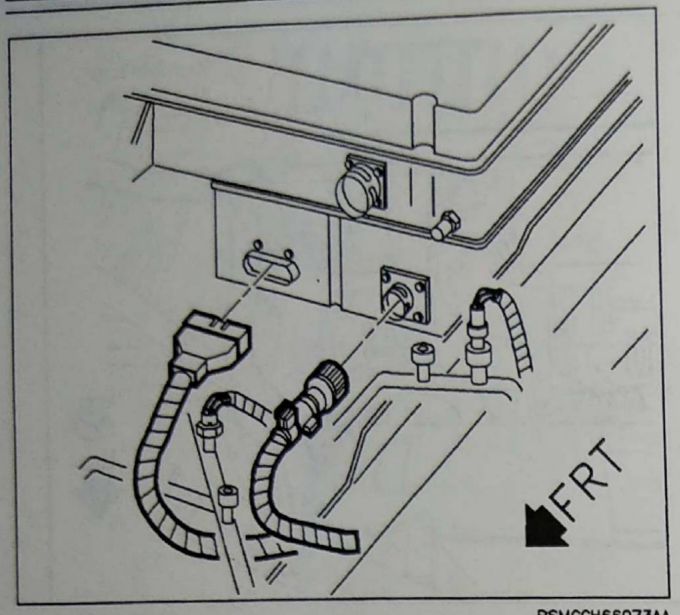
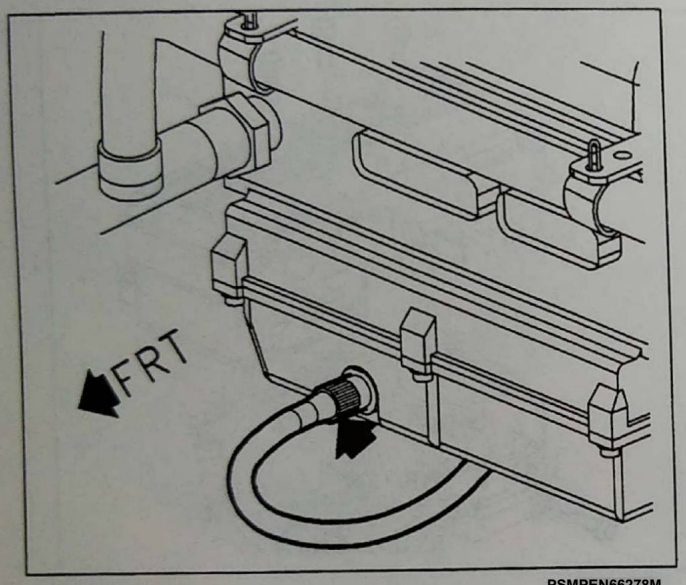


PSMGCH66073AA

5. Connect the APM 24−way connector and the APM cannon connector.

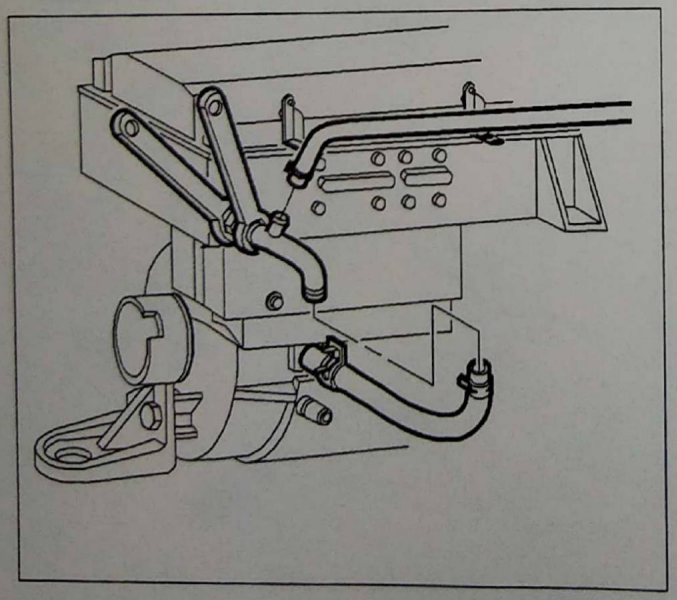


PSMPEN66278M

6. Connect the PSCM 5-way connector (yellow cable).

NOTICE: Make sure connector is properly aligned to the connection at the PSCM prior to installation, this will help avoid damaging connector pins.

7. Remove the two PIM coolant plugs.



PSMPEN67370AA

8. Install cooling outlet hose to PIM.

Torque: 36 N»m (27 ft-lbs)

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, fittings or components

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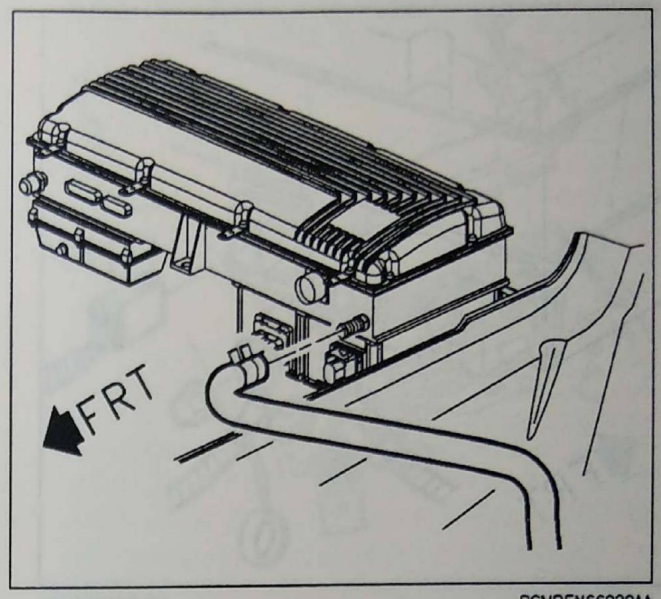
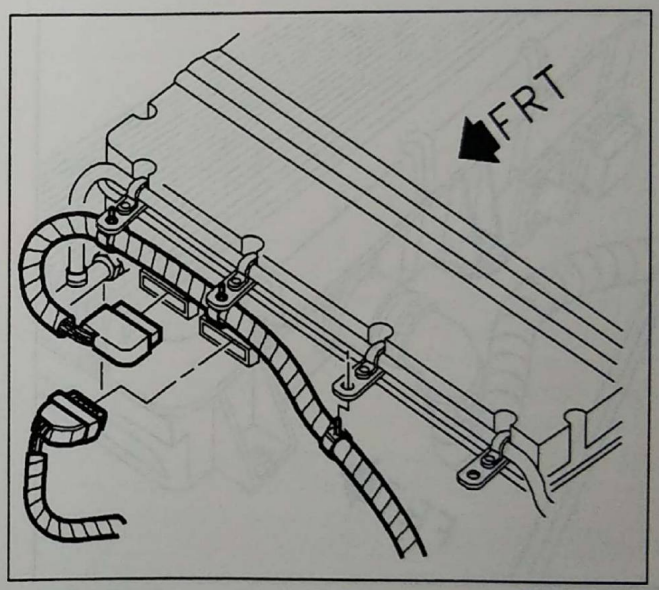
o Install hose and clamp on PIM inlet cooling fitting. Position clamp tangs at 2 o'clock.



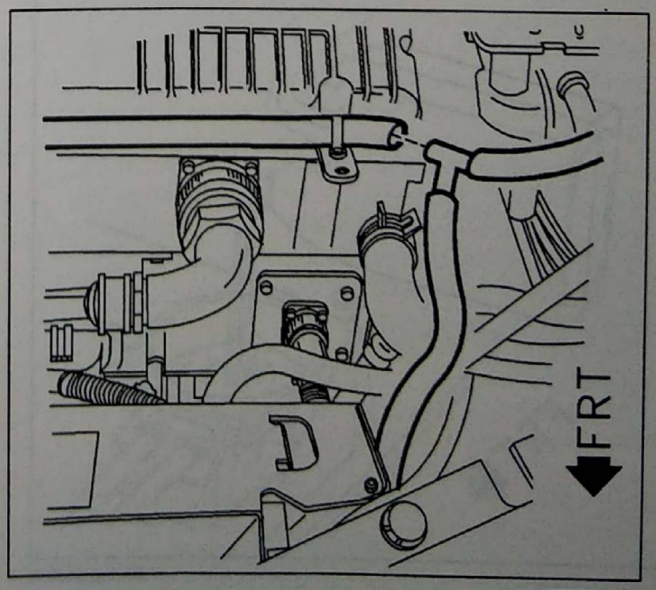
PSMPEN66020AA

10. Connect 32—way and the 24—way connectors at the front of the PIM.
11. Install the wire clips to retain PEB harness to the front PIM cover brackets.



PSMPEN66075M

12. Install vent hose to vent "T."



PSMPEN66021M

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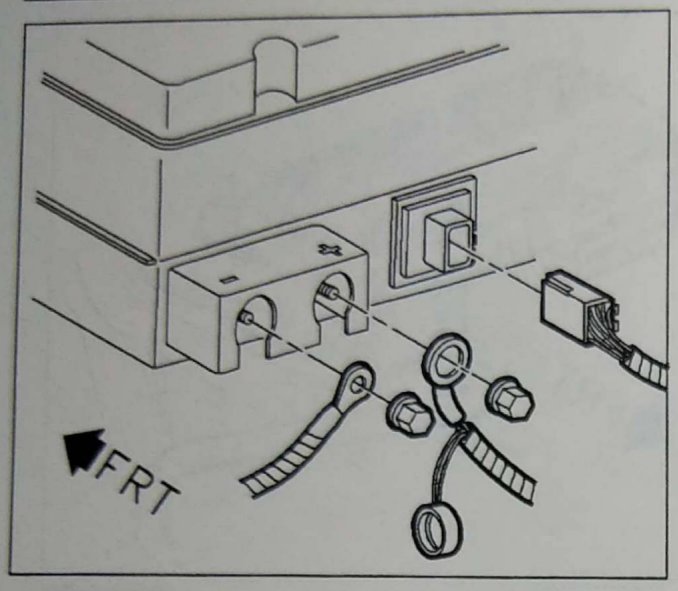
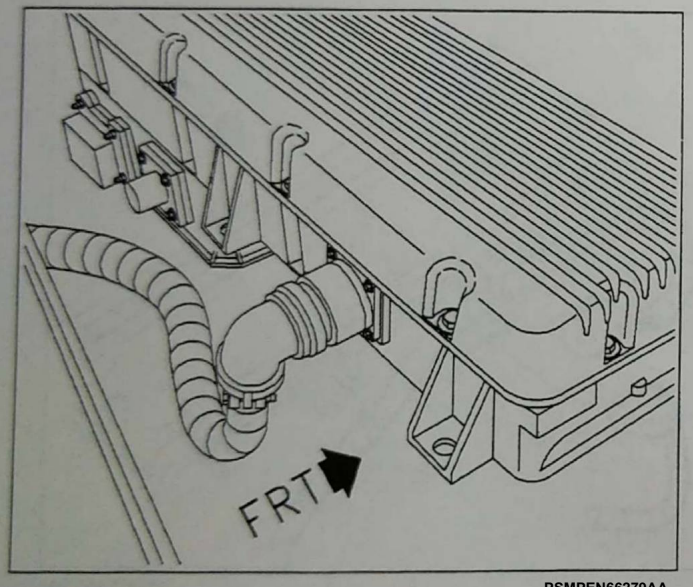


PSMPEN66019M

13. Connect the APM, 5-way connector at the rear of the APM.
14. Connect the negative and positive battery cables to the left rear of the APM.

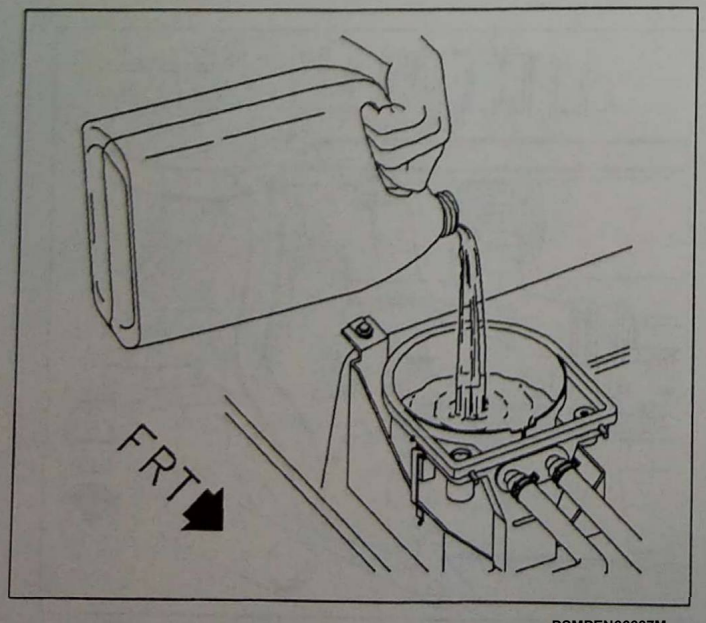


PSMPEN66279AA

15. Connect battery assembly pack cannon connector to right rear corner of the PIM. Tighten connector until indicator marks line-up.

NOTICE: Do not use any tools to reinstall the connector. Excessive force or misalignment can damage the connector pins.

16. Enable high voltage. (Refer to "High Voltage Enable" in this manual.)



PSMPEN66637M

17. Check to insure that all the hoses and fittings are connected.
18. Fill coolant system until you reach the fill line on the expansion tank with GMEV coolant part 27002485 or equivalent which meets GM spec #9986100. The fluid level will drain down into the coolant system slowly and fluid should be added until the fluid level stabilizes.
19. Place vehicle in run mode. If vehicle does not power-up, refer to the "High Voltage" section of the service manual.
20. Maintain fluid level to fill line in expansion tank.
    a. After one minute turn on heat mode. Maintain fluid level to fill line in expansion tank.
    b. After one minute turn on vent mode.

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21 Repeat previous step two more times.

22 After one minute turn on heat mode.

23. Insert charger paddle into charger receptacle. Verify charger is operating.

24. Maintain fluid level to fill line in expansion tank.

25. After one minute remove charger paddle from charger receptacle.

26. Turn HVAC system to vent mode.

27. Insert charger paddle into charger receptacle. Verify charger is operating.

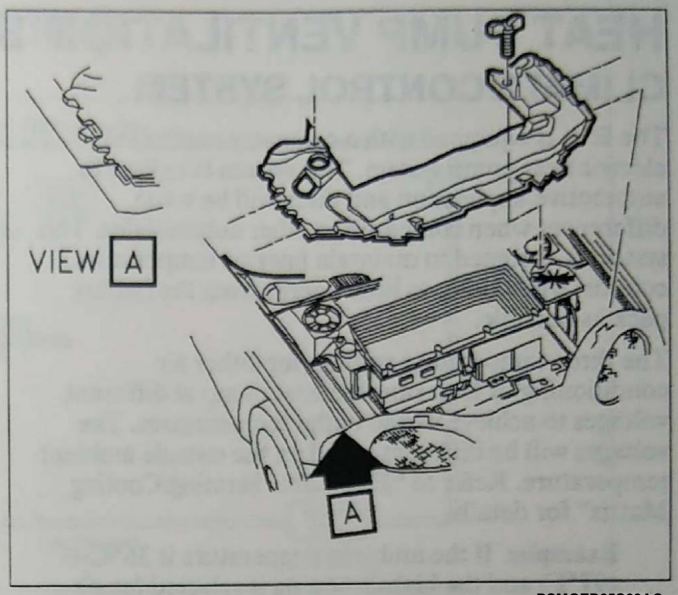
28. After two minutes remove charger paddle from charger receptacle. Top off fluid level to fill line, install cover on expansion tank and check for leaks.

29. Install engine compartment sight shield.

30. Clear all codes using PDT.

31. Raise vehicle on hoist.

32. Install front underbody air deflector. (Refer to "Front Underbody Air Deflector Installation" procedure in this manual.)



PSMGEP65S69AC

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IHEATPUMPVENTILATION SYSTEM INTRODUCTION

CLIMATE CONTROL SYSTEM

The EVi is equipped with a computer controlled electric heat pump system. This system is unique in automotive application and there will be some differences when compared to other automobiles. This system is designed to maintain interior temperature comfort while using as little energy from the battery pack as possible.

The three temperature settings for either air conditioning or heat runs the heat pump at different voltages to achieve varied outlet temperatures. The voltages will be different based on the outside ambient temperature. Refer to "EVi Cabin Heating/Cooling Matrix" for details.

> Example: If the ambient temperature is 36°C (97'F) and the highest setting is selected for air conditioning, the system will begin operation at the highest rated level of current to obtain 2000 watts, then operate in steady state mode at 1625 watts. The same selection at 30°C (86°F) will start up the same, but operate at 1125 watts in steady state mode.

Heat pumps are refrigeration machines. Refrigeration involves the removal of heat from a place where it is not wanted and depositing it in a place where it make no difference. The heat can actually be deposited in a place where it will do some good. This is the difference between a heat pump and a summer air conditioner. The air conditioner can only pump heat one way. The heat pump is a refrigeration machine that can pump heat two ways. It is normally used for space conditioning, heating and cooling.

The EVi heat pump systems six major components are the front end heat exchanger (condenser), the compressor, the orifice tube, the cabin heat exchanger (evaporator), the reversing valve, and the heat pump ventilation system/thermal control module (HTCM).

The heat exchangers either absorb heat or reject heat that has been absorbed into the vapor within the heat exchangers. The compressor pumps the heat-laden vapor through the system. The orifice tube is a metering device that controls the refrigerant flow. The reversing valve changes the direction of the refrigerant within the system to change from heating to cooling. The HTCM monitors cabin and ambient temperature, vapor temperature and pressure in the system, and adjust the system performance versus power consumption to optimize driving range.

COOLING MODE

When the heat pump system is in the cooling mode and the ambient temperature is greater than 19°C (66°F), the refrigerant vapor going into the cabin heat exchanger (evaporator) is cool. As the hot air passes through the evaporator, the refrigerant vapor absorbs the heat from inside the car and the compressor moves the heat soaked vapor to the front end heat exchanger (condenser), as the cooler outside air passes through the condenser, the air is warmed removing the heat from the refrigerant, the cooled refrigerant then goes back to the cabin to start the cycle again.

When the heat pump system is in the cooling mode and the ambient temperature is less than or equal to 19°C (66°F) the indicator lights on the run/lock shifter assembly will come On but the heat pump system will not operate. Vent mode will be the only method of cooling the interior, available at these temperatures.

HEATING MODE

When the heat pump system is in the heating mode and the ambient temperature is less than or equal to 19°C (66°F), the refrigerant vapor going into the cabin heat exchanger (evaporator) is warm, as the cool cabin air passes through the evaporator it absorbs the cold from inside the car, the compressor is moving the cooler soaked vapor to the front end heat exchanger (condenser), as the outside air passes through the cold condenser the air is cooled removing the lower temperature from the refrigerant, the warm refrigerant then goes back to the cabin to start the cycle again. Powertrain coolant is also circulated through the heater core assisting int he heating of the EVi.

When the heat pump system is in the heating mode and the ambient temperature is greater than 19°C (66°F), the heat pump compressor will not come on. Heating during this temperature range will be accomplished using heat generated from the coolant system through the heater core.

During the heating mode with the outside ambient temperature below 40°F the HTCM monitors refrigerant temperature coming out of the condenser *if* the refrigerant temperature gets too cold, the system will shut off the reversing valve will move and the system will actually go into the cooling mode, this is called the De-FEX mode. The cabin blower fan will turn off and remain off until the De-FEX cycle is complete, which takes 3-5 minutes. This mode is necessary in order to keep the front end heat exchanger (condenser) from freezing during the heat mode. The heat pump system will do this automatical when the system senses the condenser is too cold to operate correctly in the heat mode. Once the heat pump system starts the De-FEX cycle it can not be turned off and will have to complete the 3-5 minute cycle time.

The heat pump system is controlled by a heat pump ventilation/thermal control module (HTCM) that looks at the exterior ambient and the power level requested from the run/lock shift assembly controls. The HTCM will then command a certain amount of voltage to the compressor to maintain comfort in the cabin and optimize driving range. The first three minutes of the selected temperature range the compressor will run at a higher voltage to get the cabin temperature cooler or warmer depending on the mode selected. Then the voltage will be commanded to a lower steady state to optimize driving range while maintaining comfort.

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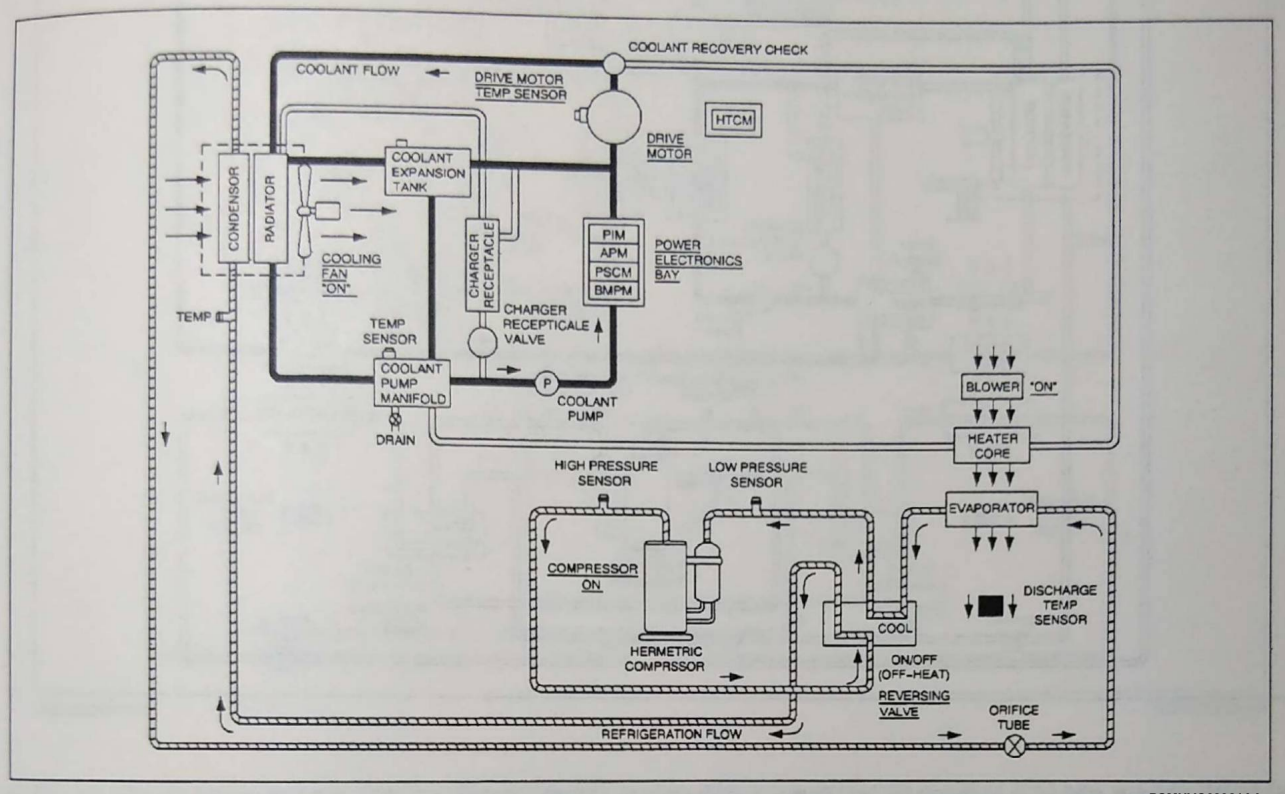
HEAT PUMP VENTILATION SYSTEM



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HEAT PUMP VENTILATION THERMAL CONTROL SYSTEM

"COOL MODE" FOR AMBIENT TEMPERATURES GREATER THAN 19°C (66°F) (HEAT PUMP ACTIVE)

SYSTEM OPERATION

The interior is cooled by the heat pump when any of the three COOL MODES are selected on the run/lock shifter assembly (RSA) and the outside ambient temperature is greater than 19'C (66°F). As illustrated in the above diagram in a solid line, coolant does not flow through the heater core because the coolant recovery check valve diverts the coolant from the propulsion system to the radiator. Refrigerant flow is indicated by the striped line in the above diagram. 'When refrigerant is pumped in this direction, the cabin heat exchanger inside the car is used as an evaporator to cool the interior. The front end heat exchanger is used as a condenser to remove heat build up in the refrigerant similar to current automotive air conditioning system. When RECIRC is On in cool mode and heated windshield is selected on the RSA the system will change to outside air to inhibit condensation build up on the inside of the glass. If cool mode is'selected below 19'C (66"F), the LEDs on the RSA will come On and the heat Pump will remain inactive.

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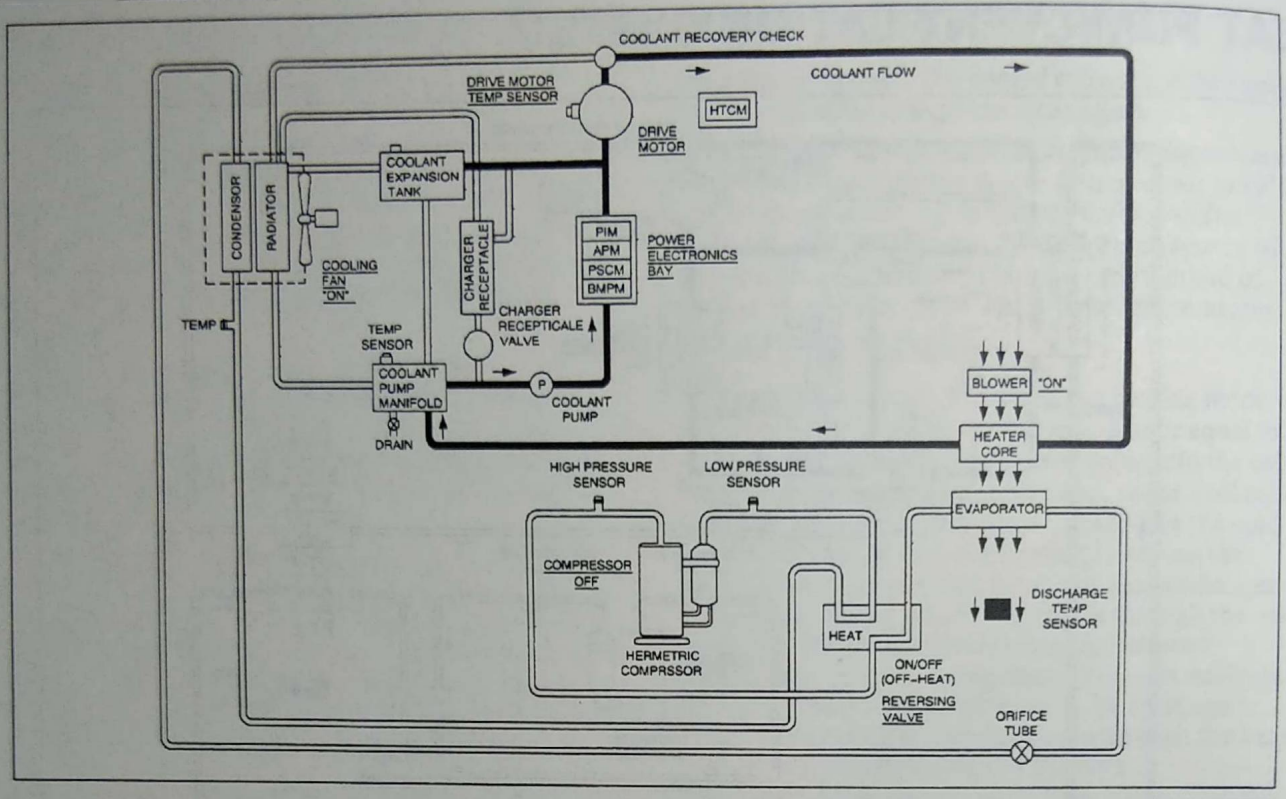

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"HEAT MODE" FOR AMBIENT TEMPERATURES GREATER THAN 19°C (66°F) (HEAT PUMP INACTIVE)

SYSTEM OPERATION

The interior is heated by coolant through the heater core when any of the "HEAT MODES" are selected on the run/lock shifter assembly and the outside temperature is greater than 19"C (66°F). As illustrated in the above diagram in a solid line, coolant flows through the heater core because the coolant recovery check valve diverts the coolant from the propulsion system to the heater core. The heat pump system will be inactive when heat mode is selected above 19°C (66°F).

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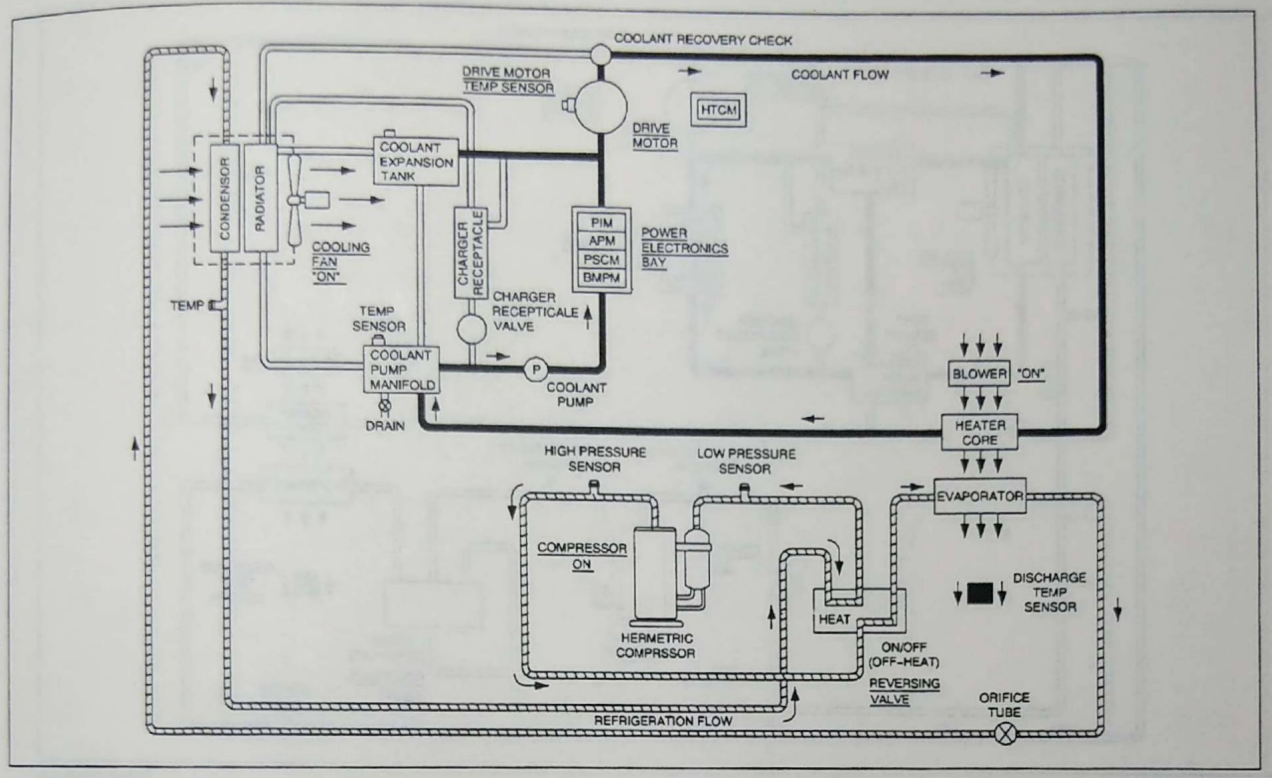

PSMHVC68320AA

"HEAT MODE" FOR AMBIENT TEMPERATURES EQUAL TO OR LESS THAN 19'C (66'F) (HEAT PUMP ACTIVE)

SYSTEM OPERATION

The interior is heated by coolant through the heater core and heat pump active when any of the "HEAT MODES" are selected on the run/lock shifter assembly and the outside temperature is less than or equal to 19'C (66"F). As illustrated in the above diagram in a solid line, coolant flows through the heater core because the coolant recovery check valve diverts the coolant from the propulsion system to the heater core. Refrigerant flow is indicated by the striped line in the above diagram. When refrigerant is pumped in this direction, the cabin heat exchanger is used as a condenser to warm the interior. The front end heat exchanger is used as an evaporator. When "RECIRC" is On in theat mode and heated windshield is selected On the RSA, the system will change to outside air to inhibit condensation build up on the inside of the glass.

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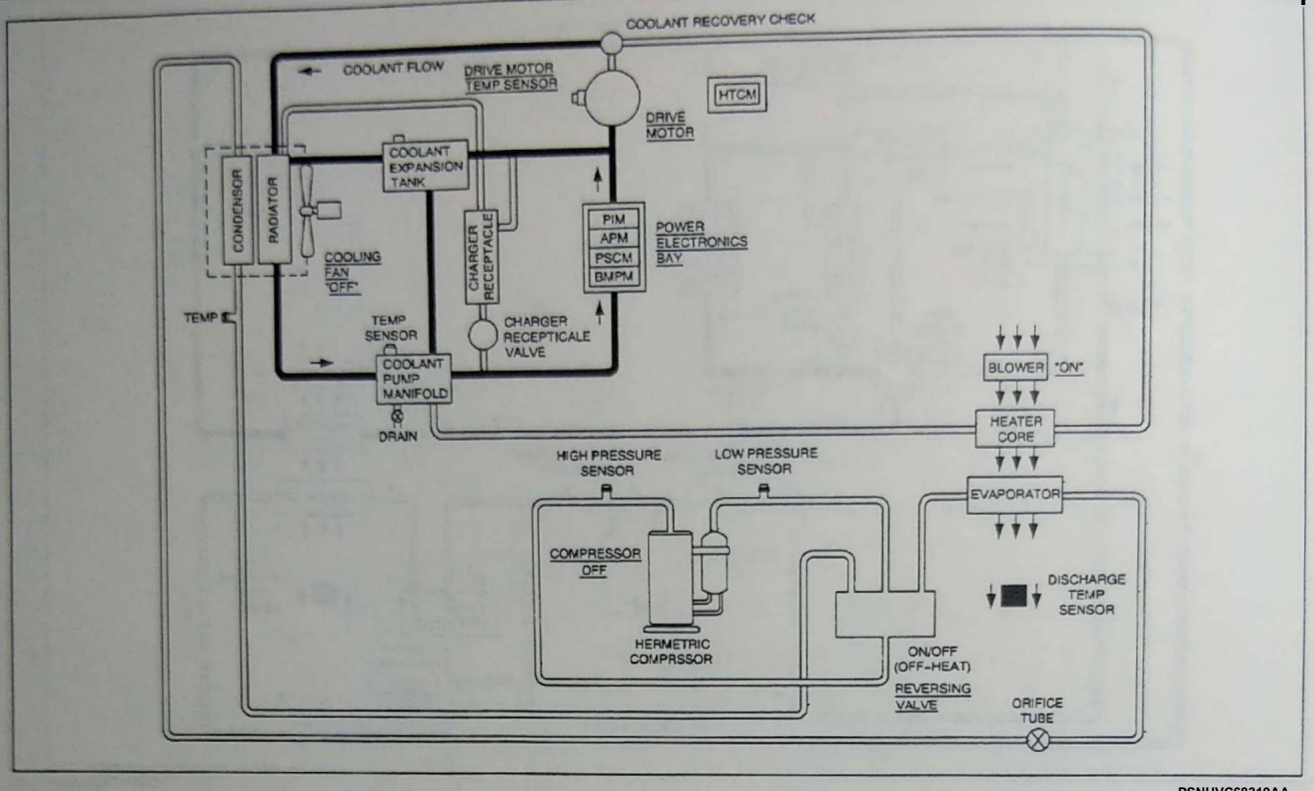

PSNHVC68319AA

"VENT MODE" FOR ALL TEMPERATURE RANGES (HEAT PUMP INACTIVE)

SYSTEM OPERATION

Hie interior is ventilated with outside air when "VENT MODE" is selected on the run/lock shifter assembly durina all temperatures. As illustrated in the above diagram in a solid line, coolant flows through the radiator because rhe' coolant recovery check valve diverts the coolant from the propulsion system to the radiator. The heat pump system will be inactive when vent mode is selected. Vent mode is the only way to cool the interior when the outside temperature is equal to or less than 19°C (66°F).

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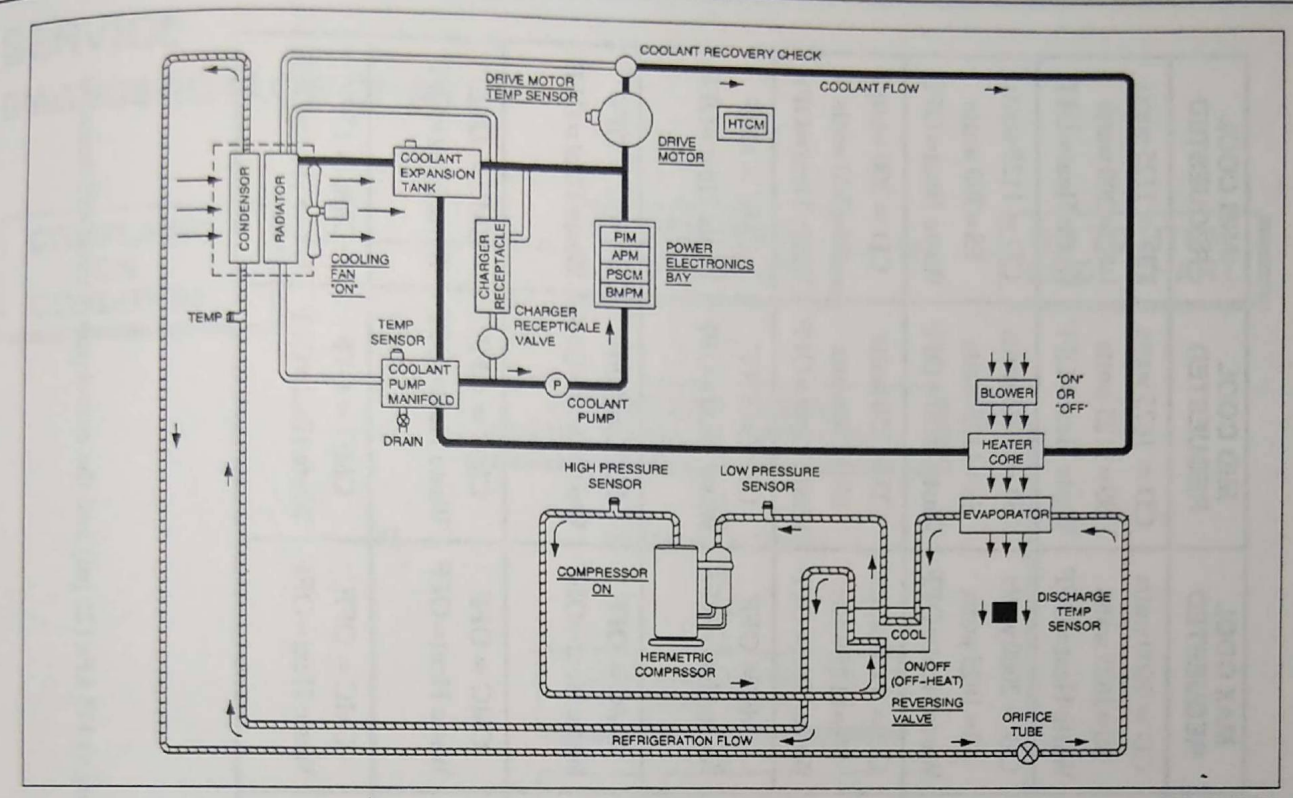

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"DE-FEX CYCLE" WHEN IN "HEAT MODE" (HEAT PUMP ACTIVE)

* SYSTEM OPERATION

The De-Fex cycle may occur when the heat pump system is operating in heat mode and the outside temperature is below 5°C (40°F). The purpose of De-Fex is to defrost the front end heat exchanger (condenser). When in De-Fex, the reversing valve will change to cool mode, reversing the flow of refrigerant and warming the front end heater exchanger, the heat pump will operate in cool mode for three to five minutes. During this time, the blower motor will turn Off and coolant will continue to flow through the heater core. When De-Fex has completed the cycle, the reversing valve will go back to heat mode and blower motor speed will resume to the previous settings. The De-Fex cycle will occur when the refrigerant temperature is very cold which could cause poor heating performance. Once the De-Fex cycle has started it can't be over ridden by turning the heat pump system Off, the system will continue to run until De-Fex cycle is complete.

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a
5 EV1 CABIN HEATING / COOLING POWER OPERATION MATRIX

4C

AMBIENT TEMPERATURE	MAX HEAT REQUESTED	MID HEAT REQUESTED	MIN HEAT REQUESTED	VENT REQUESTED	MAX COOL REQUESTED	MID COOL REQUESTED	MIN COOL REQUESTED
>35*C(95'F)	CMC = OFF Waste IIcat=ON	CMC = OFF Waste Heat=ON	CMC = OFF Waste Heat=ON	CMC = OFF Waste Heat=OFF	CD = 2000 watts SS=1625 watts Waste Heat = OFF	CD = 1625 watts SS= 1125 watts Waste Heat=OFF	CD =1125 watts SS=300 watts Waste Heat=OFF 1
_≤35'C(95*F) >29'C(84'F)	CMC = OFF Waste Heat=ON	CMC = OFF Waste Heat=ON	CMC = OFF Waste Hcat=ON	CMC = OFF Waste Heat=OFF	CD = 2000 watts SS=1625 watts Waste Heat=OFF	CD = 1625 watts SS= 1125 watts Waste Heat=OFF	CD =1125 watts 1 SS=300 watts Waste Heat=OFF 1
_≤29'C(84'F) > 19'C(66"F)	CMC = OFF Waste Heat = ON	CMC = OFF Waste Heat=ON	CMC = OFF Waste Heat=ON	CMC = OFF Waste Heat=OFF	CD = 1125 watts SS= 1125 watts Waste Heat = OFF	CD = 750 watts SS=750 watts Waste Heat=OFF	CD = 300 watts 1 SS=300 watts Waste Heat=OFF 1
_≤19'C(66*F) >05'C(41·'F)	WU=1125 watts SS=700 watts Waste Heat=ON	WU=700 watts SS=500 watts Waste Heat=ON	WU=500 watts SS=300 watts Waste Heat=ON	CMC = OFF Waste Hcat=OFF	CMC = OFF Waste Heat=OFF	CMC = OFF Waste Heat=OFF	CMC = OFF Waste Heat=OFF 1
_≤05'C(41'F) > Ol'C (34°F)	WU=1125 watts SS=1125 watts Waste Heat=ON	WU = 1125 watts SS=700 watts Waste Heat=ON	WU=700 watts SS=300 watts Waste Heat=ON	CMC = OFF Waste Heat=OFF	CMC = OFF Waste Heat=OFF	CMC = OFF Waste Heat = OFF	CMC = OFF Waste Heat=OFF I
_≤01*C(34'F) " >-4"C(25°F)	WU=1800 watts SS=1125 watts Waste Heat=ON	WU=1625 watts SS=800 watts Waste Ileat=ON	WU = 1125 watts SS=500 watts Waste Hcat=ON	CMC = OFF Waste Hcat=OFF	CMC = OFF Waste Hcat=OFF	CMC = OFF Waste Hcat=OFF	CMC = OFF Waste Heat=OFF 1
_<-4°C(25°F)	WU=1125 watts SS=700 watts Waste Heat=ON	WU=1125 watts SS=700 watts Waste Heat=ON	WU = 1125 watts SS=700 watts Waste Heat=ON	CMC = OFF Waste Hcat=OFF	CMC = OFF Waste Heat = OFF	CMC = OFF Waste Hcat=OFF	CMC = OFF Waste Hcat = OFF

WU = Warm Up
SS = Steady State
CD = Cool Down

Watts shown are the maximum HTCM command. The compressor will enter lowside pressure limiting at 175 kPa (25 psi) and the actual power used will decrease.
To determine the wattage value multiply CMC DC current by Pack Voltage.

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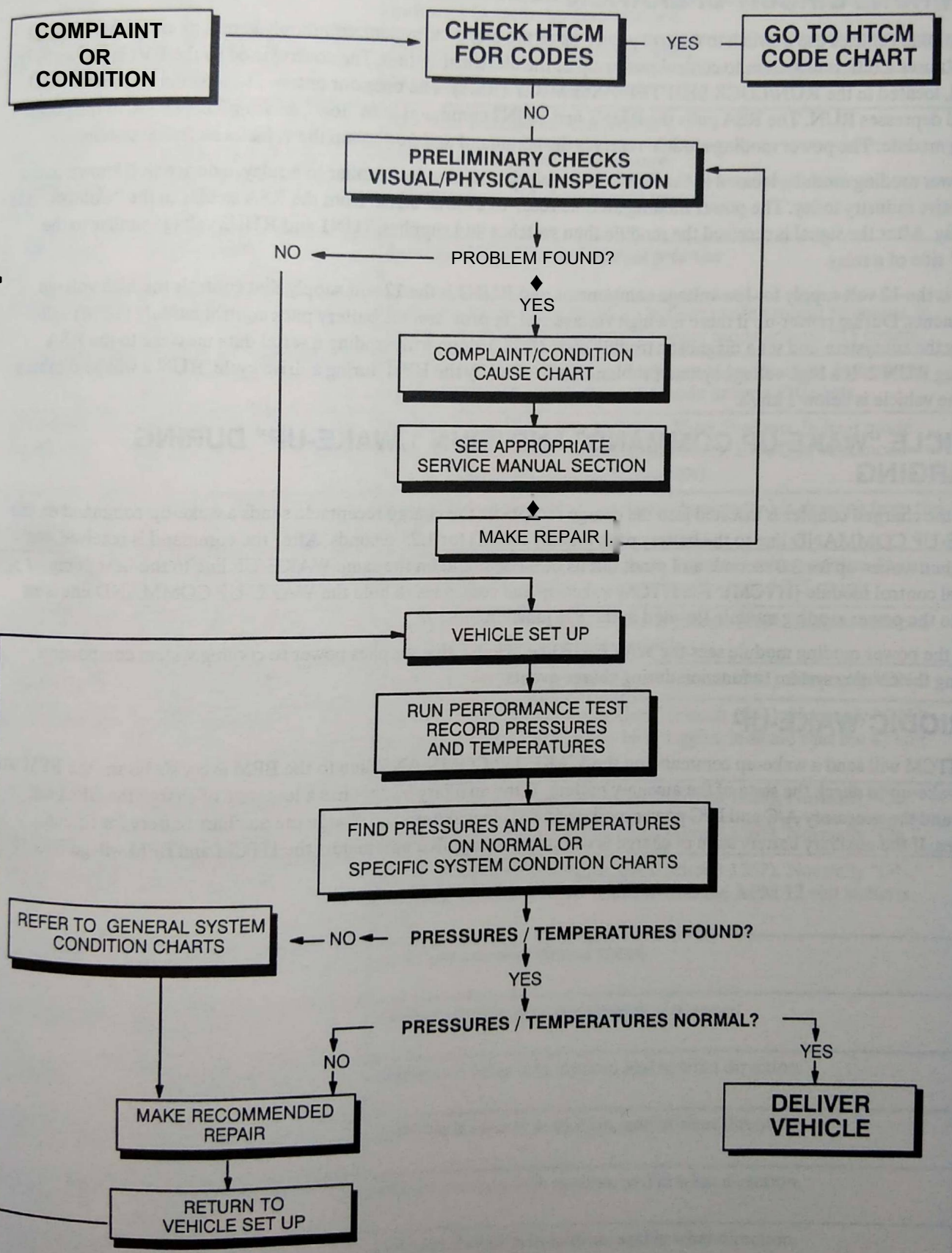
SERVICE

DIAGNOSTIC FLOW CHART



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POWER DISTRIBUTION

SYSTEM OPERATION

RUN1/RUN2 CIRCUIT OPERATION

Conventional vehicles use a switch to control power-up of the electrical system, commonly known as an ignition switch. The EVi uses a different system to control power-up of the electrical system. The control used by the EVi is known as the key pad, located in the RUN/LOCK SHIFTER ASSEMBLY (RSA). The operator enters a valid key code into the key pad and depresses RUN. The RSA pulls the RUN1 and RUN2 command lines "low", sending a command to the power moding module. The power moding module receives the command and powers-up the vehicles electrical system.

The power moding module, located in the RH junction block operates very similar to a relay, a device well known in the automotive industry today. The power moding module receives a "low" signal from the RSA similar to the "Control" side of a relay. After the signal is received the module then switches and supplies RUN1 and RUN2 voltage similar to the "Load" side of a relay.

RUN1 is the 12 volt supply for low voltage components and RUN2 is the 12 volt supply that controls the high voltage components. During power-up if there is a high voltage system problem, the battery pack control module (BPM) will identify the subsystem and set a diagnostic trouble code (DTC) along with sending a serial data message to the RSA disabling RUN 2. If a high voltage system problem is identified by the BPM during a drive cycle, RUN 2 will be disabled after the vehicle is below 1 km/h.

VEHICLE "WAKE-UP COMMAND" AND "RUN 1/WAKE-UP" DURING CHARGING

When the charged coupler is inserted into the charge receptacle the charge receptacle sends a wake-up command on the WAKE-UP COMMAND line to the battery pack module (BPM) for 1.25 seconds. After the command is received, the BPM then wakes-up for 3.0 seconds and sends out its own command on the same WAKE-UP line to the heat pump / thermal control module (HTCM). The HTCM wakes-up and continues to hold the WAKE-UP COMMAND line is an /J input to the power moding module (located in the RH junction block).

When the power moding module sees the WAKE-UP line "High", this supplies power to cooling system components allowing the cooling system to function during charge events.

PERIODIC WAKE-UP

The HTCM will send a wake-up command on the WAKE-UP COMMAND line to the BPM every six hours, the BPM will then wake-up to check the state of the auxiliary battery. If the auxiliary battery has a low state of charge the BPM will command the accessory A/C and D/C power module (APM) to wake-up and charge the auxiliary battery for fifteen minutes. If the auxiliary battery state of charge is within the acceptable parameters the HTCM and BPM will go back to sleep.

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■j^CR/TsCAN TOOL INFORMATION

GENERAL INFORMATION

PARAMETER	SCAN TOOL DISPLAY	DEFINITION
~OSATEMP	-40°Cto +60°C	Indicates Outside Air Temperature
DSCHRG	-40°Cto +85°C	Indicates Discharge Air Temperature
COOLANT	-20°C to +100°C	Indicates Coolant Temperature
REFRIG	-40°Cto +100°C	Indicates Refrigerant Temperature
DRV UNIT	-20°Cto +100°C	Indicates Drive Unit Temperature
LO SIDE A/C KPA	0-695 kPa	Indicates Low Side Refrigerant pressure
HI SIDE A/C KPA	0-3185 kPa	Indicates High Side Refrigerant pressure
MODE DOOR FB	0-255	Indicates Mode Door Position. In floor mode around 50 counts, in split mode around 100 counts, In upper mode around 215 counts.
OSA VALVE FB	0-255	Outside Air Valve Feedback. Indicates Valve Position. In fresh air mode around 30 counts, In recirc mode around 210 couts.
COOLANT VALVE FB	0-255	Coolant Valve Feedback. Indicates Valve Position. In heat mode around 40 counts (coolant to heater core), In A/C or vent mode around 255 counts (coolant to radiator).
CMC DC CURRENT	0.0-8.0 amps	Amount of current the compressor (heat pump) is drawing from the CMC.
CR VALVE FB	0-255	Charge Receptacle valve feedback. Indicates valve position. In run mode around 40 counts. In charge mode around 255 counts.
CMC/47V BIT 2	"ON" or "OFF"	Starus of CMC/47 volt status line 2 (circuit 1063). Toggles between "ON" and "OFF" once each second.
CMC/47V BIT 1	"ON" or "OFF"	Status of CMC/47 volt status line 1 (circuit 1062). Normally "ON."
CMC/47V BIT 0	"ON" or "OFF"	Status of CMC/47 volt status line 0 (circuit 1061). Normally "ON." Status bits 0 and 1 ON, while bit 2 toggles, indicate that the 47 volt and CMC status are O.K.
AFM12V BIT 2	"ON" or "OFF"	Status of APM 12 volt status line 2 (circuit 1264). Normally "On."
APM12V BIT 1	"ON" or "OFF"	Status of APM 12 volt status line 1 (circuit 1263). Normally "On."
APM12V BIT 0	"ON" or "OFF"	Status of APM 12 volt status line 0 (circuit 1262). Normally "ON." All three status bits "ON" indicate that the APM 12 volt status is O.K.
C s^LWR	0-100%	Commanded cabin blower speed
C (^CMDSPD	0-132 HZ	Commanded compressor (heat pump) speed
CR VALVE	"CW","CCW" or "STOP"	Indicates if valve is in motion, and in what direction.
COOL VALVE	"CW","CCW" or "STOP"	indicates if valve is in motion, and in what direction.
OS - Awr--	7CW","CCW" or "STOP"	Indicates if valve is in motion, and in what direction.
MODE DOOR	"CW","CCW" or "STOP"	Indicates if door is in motion, and in what direction.

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HTCM SCAN TOOL INFORMATION

GENERAL INFORMATION

PARAMETER	SCAN TOOL DISPLAY	DEFINITION
BRAKE LOADSHED	"YES" or "NO"	Indicates if a loadshed is occurring.
RUN1	"ON" or "OFF"	Indicates if Run 1 is present.
WAKEUP LINE	"YES" or "NO"	Indicates if the wakeup signal is present.
COOLANT LEVEL OK	"YES" or "NO"	Indicates if coolant level is O.K.
REAR DEFOG CMD	"ON" or "OFF"	Rear window defog command status.
WINDSHIELD CMD	"ON" or "OFF"	Windshield defog/de-ice command status.
REV VALVE CMD	"ON" or "OFF"	Reversing valve command status.
COOL PUMP SPD %	0-100%	Coolant pump commanded speed. Normally 20% in charge mode, 71% in run mode.
FRONTEND FAN %	0-100%	Front end fan commanded speed.
OP STATE	"PRECOND", "CHARGE", "DRIVE", "PERIOD W-UP"	Operating state. "CHARGE" while charging, "DRIVE" in Run mode (with paddle not in receptacle), "PERIOD W-UP" if in periodic wakeup state, "PRECOND" if preconditioning is currently taking place.
CMC GROUND VLT	0-5 volts	Indicates case sense voltage detected. Normally 0.0 volts.
PS GROUND VLT	0-5 volts	Indicates case sense voltage detected. Normally 0.0 volts.
CURRENT CODES		
T-CODE/FLAG	"YES" or "NO"	Yes if any current DTCs are present.
HISTORY CODES		
T-CODE/FLAG	"YES" or "NO"	Yes if any history DTCs are present.
SYSTEM ID		
ROM ID	XXXXXXXX	
CAL ID	XXXXXXXX	

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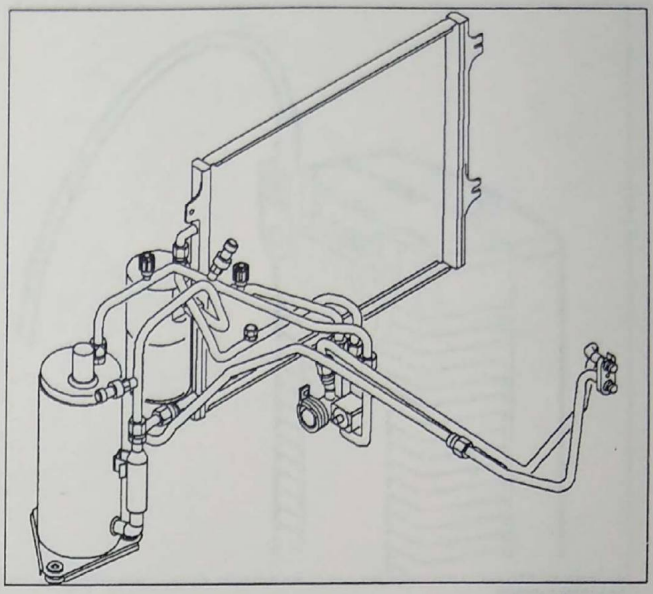
PRELIMINARY CHECKS



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Most A/C system problems can be detected by a thorough visual and physical inspection of the system and its components.

1. Check for all diagnostic trouble codes (DTCs). If DTC(s) are present, refer to the Diagnostic Chart for that DTC.

CAUTION: IF HTCM - DTC-025 OR ANY OTHER DTCS ARE SET, REFER TO THE DIAGNOSTIC CHARTS FOR THOSE DTCS BEFORE PROCEEDING FURTHER. FAILURE TO FOLLOW THIS CAUTION COULD RESULT IN PERSONAL INJURY OR VEHICLE DAMAGE.

2. Check the air inlet duct, side air deflectors, condenser to radiator seals, and rear hood seal for missing or damaged parts.

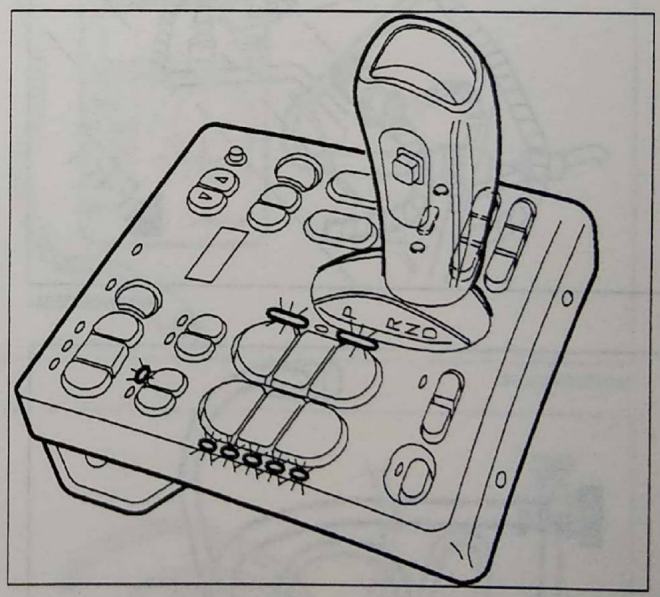
IMPORTANT: The importance of this check cannot be stressed enough because proper heating and cooling depends upon adequate front air flow.

3. Check outer surfaces of radiator and condenser cores to be sure air flow is not blocked by dirt, leaves or other foreign material.
4. Check for kinks in lines. Also check for refrigerant leaks using an electronic leak detector.
5. Check blower motor operation at all five speeds.
6. With blower on high, check for equal distribution of air out of all outlets.
7. Check operation of mode door control and the distribution of air from the designated outlets. (The PDT may be used to monitor mode door feedback.)
8. Depress Recirc button with blower on High. A noticeable increase in air flow and sound should occur. Indicator should light. (The PDT may be used to monitor recirc door feedback.)

K 9. With vehicle in Run mode, operate A/C system until it is up to operating temperature.

10- Check electric cooling fan operation with A/C On.

[1]1 • Check operation of compressor. (Refer to "Heat Pump Compressor Test" found in this service manual.)



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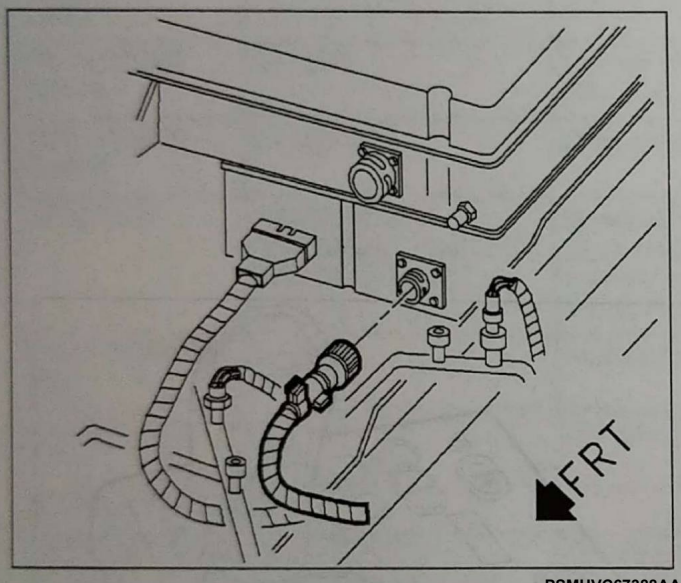
TEST 1 - HEAT PUMP COMPRESSOR INSULATION/MEGGER TEST

CAUTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS, THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANY TIME SERVICE WORK IS BEING PERFORMED ON OR AROUND THE HIGH VOLTAGE SYSTEM. WHEN IN DOUBT, ALWAYS DISABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DISABLED.

1. Place key pad in the LOCK mode.
2. If high voltage system has been disabled, proceed to step 3. If the high voltage system has not been disabled, refer to “High Voltage Disable” procedure in this manual and disable the high voltage system.
3. Disconnect heat pump compressor wire harness cannon connector from the accessory power module (APM).



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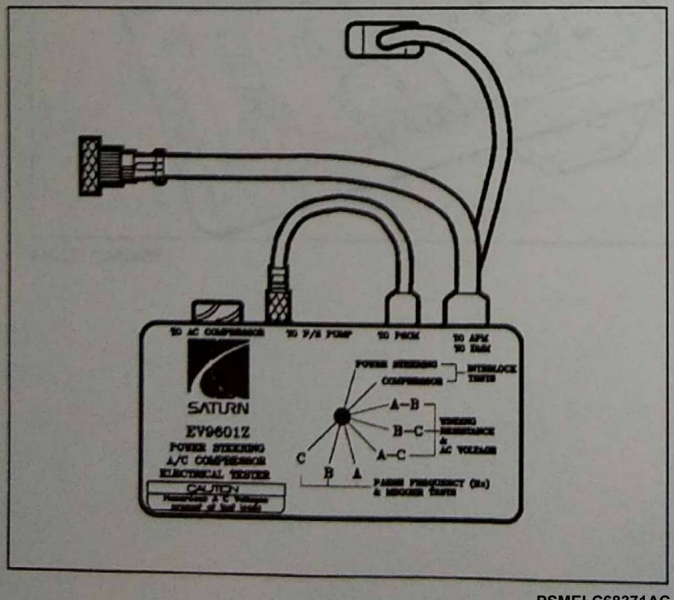

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4. Install wire harness cannon connector from compressor into EV9701Z (power steering - A/C compressor electrical tester).

IMPORTANT: Do not connect wire harness connector from EV9701Z (power steering — A/C compressor electrical tester) into APM connector at this time.

IMPORTANT: Connect power steering lead from EV9701Z into P/S connector on tester. Failure to do this will lead to inaccurate results.

5. Select a MEGGER switch position on EV9701Z (power steering - A/C compressor electrical tester).

IMPORTANT: Megger tests can be performed at either of the switch points A, B or C.

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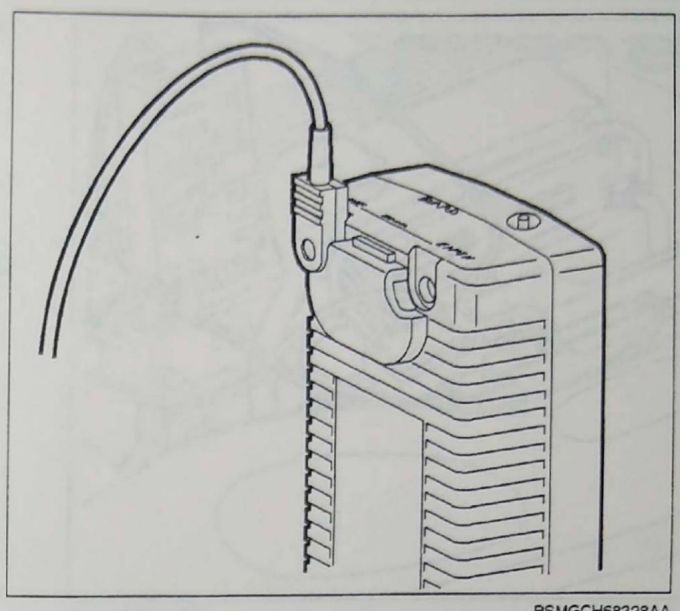
6. install EV9735Z (Digital Insulation Tcster/M^ s test leads into the back of tester. ^cgger)

7 Install black wire to EARTH (ground! to LINE (line probe). ^gr^un^>. Orange wire

„„rORT*NT, Make sure the lea* are fully sea'ed, nto tester.



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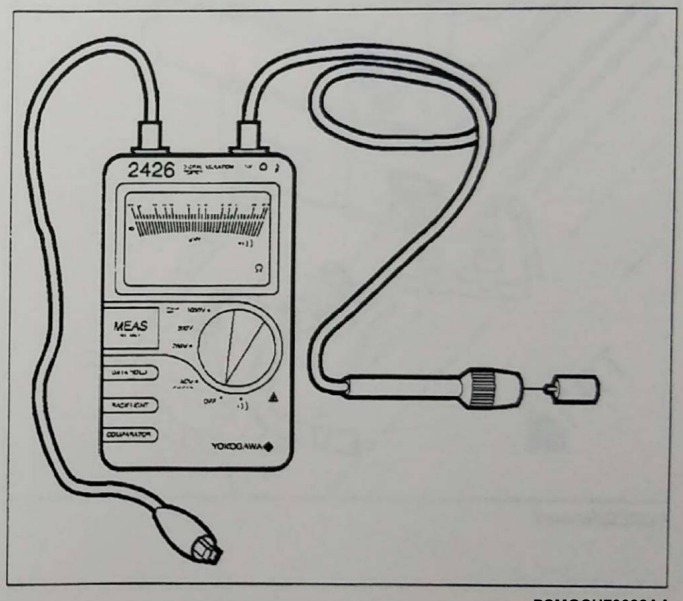
8. Make sure that the DVOM plug adaptor is attached to the line probe (orange wire) on the EV9735Z (Digital Insulation Tester) and connect to the red side of the EV9701Z (power steering - A/C compressor electrical tester) DVOM connector.



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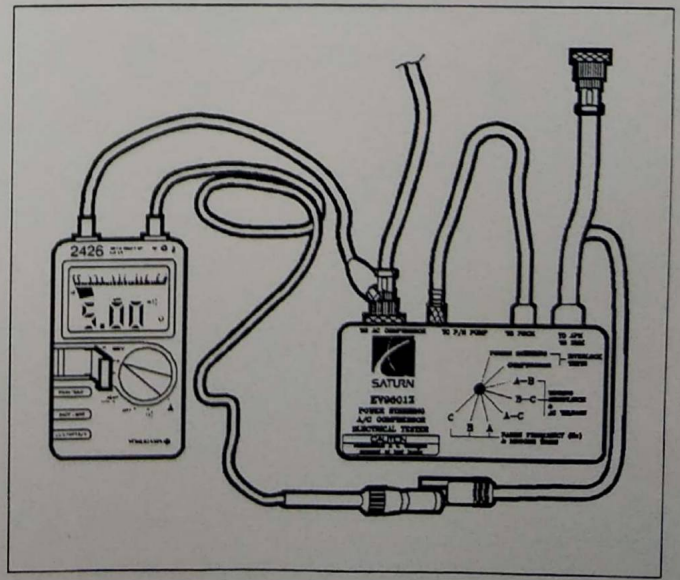
9. Connect the EARTH ground (black wire) from the tester to the heat pump compressor wire harness cannon connector body.
10. Set EV9735Z (Digital Insulation Tester) to the 500 volt range.

CAUTION: TO PREVENT SHOCK .OR BUR . NS ALWAYS HAVE METER HOOKED UP AND **IN POSITION TO TAKE MEASUREMENTS. IF N OT MAKE SURE THE PROBE END IS NOT TOUCHING ANYTHING. AS SOON AS THE METER MEASURE** HANDLE IS LIFTED, THERE IS VOLTAGE **POTENTIAL ACROSS THE MEI ER.**

11. Lift the meter measure handle on EV9734Z (Digital Insulation Tester). Notice the High Voltage LED on in the right — top corner. This indica tes high voltage is present on the tool.



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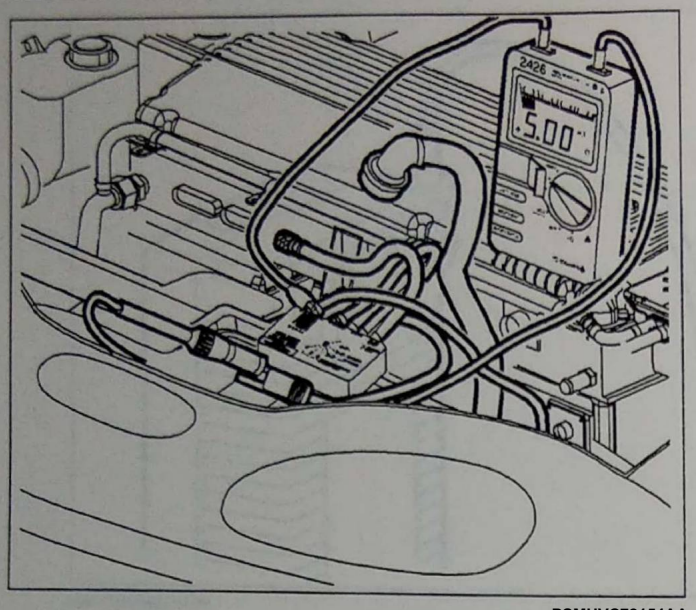

PSMHVC72154AA

12. With the meter measure handle lifted, view/record measurement on tester.
13. Reading should be between 5.0 MQ (5.0 MEG-OHMS) and infinity (0L).
14. If reading is not within the range listed in step 13, replace heat pump compressor motor assembly.
15. If reading falls within the range listed in step 13, refer to “Test 2 - Heat Pump Compressor Electrical Test in this manual.

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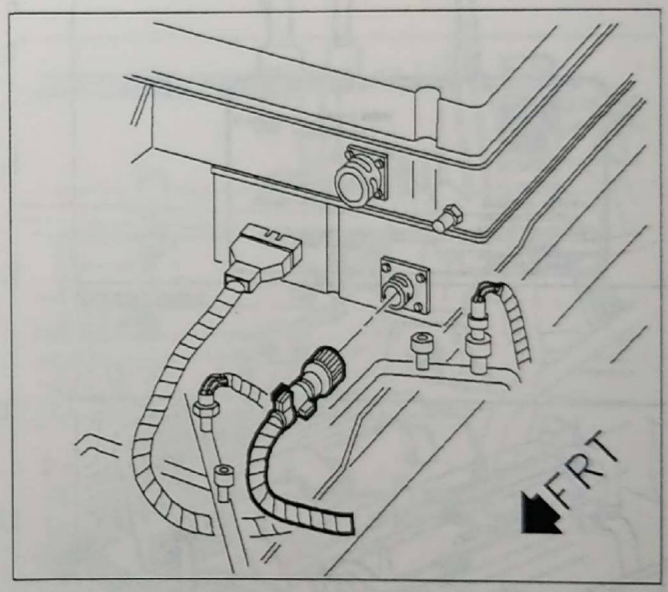
TEST 2 - HEAT PUMP COMPRESSOR ELECTRICAL TEST

I r4l T10N: TO REDUCE THE RISK OF SEVERE SHOCKS AM) BURNS. THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANA TIME SI RMCE WORK IS BEING PERFORMED ON OR 4ROUND THE HIGH VOLTAGE SYSTEM, WHEN IN POUBT. ALWAYS DIS ABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DISABLED.

1. Place key pad in the LOCK mode.

2 If high voltage system has been disabled, proceed to step 3. If high voltage has not been disabled, refer to "High Voltage Disable" procedure in this manual and disable high voltage system.

3. Disconnect heat pump compressor wire harness cannon connector from the accessory power module (APM).



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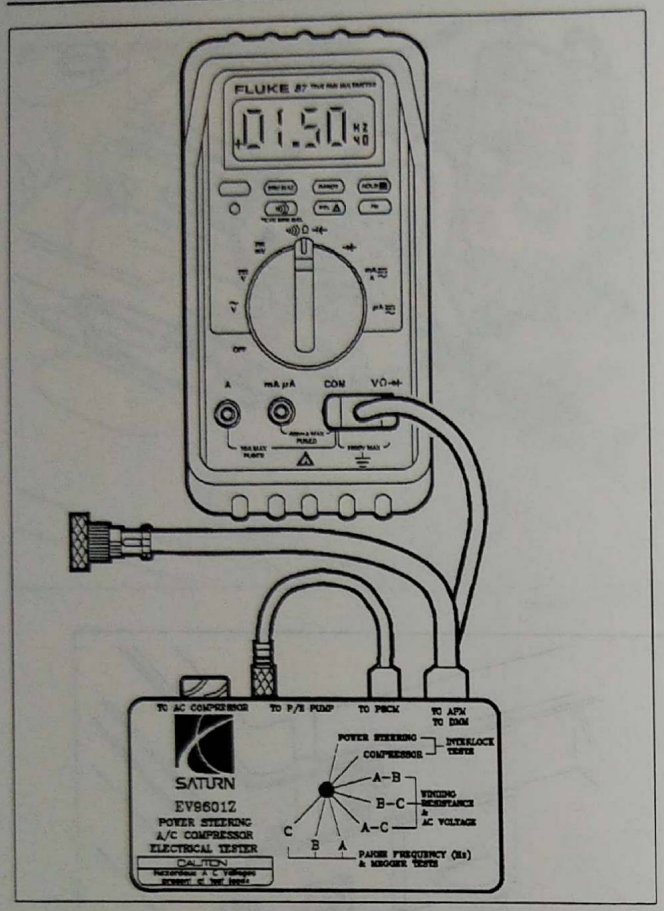

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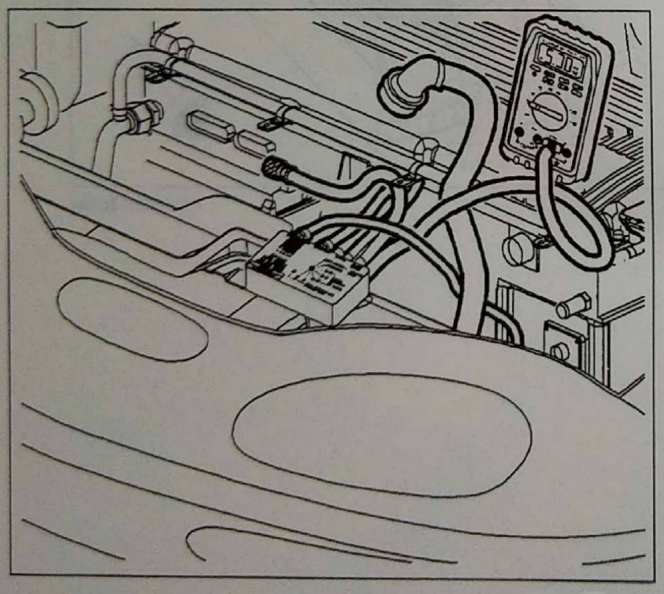

PSMHVC72153AA

4. Install wire harness connector from compressor motor into EV9701Z (power steering - A/C compressor electrical tester).
5. Connect digital multimeter (DVOM) lead from EV9701Z into DVOM.

IMPORTANT: Do not connect wire harness connector from EV9701Z (power steering - A/C compressor electrical tester) into APM connector at this time.

IMPORTANT: Connect power steering lead from EV9701Z into P/S connector on tester. Failure to do this will lead to inaccurate results.

NOTICE: When using a multimeter on the ohmmeter scale, make sure the circuit or component is disconnected from the power source. Applying voltage to a multimeter when you are measuring resistance can damage the multimeter.

6. Set DVOM to the ohmmeter setting.
7. Measure compressor motor winding resistance at switch points A-B, B-C, A-C and COMPRESSOR INTER-LOCK.
8. Resistance at switch points A-B, B-C, and A-C should be between 0.8 - 2.0 ohms at normal/typical operating temperature.
9. Resistance at switch point COMPRESSOR INTER-LOCK should be less than 1.0 ohm at normal/typical operating temperature of 50°C (120°F).
10. If resistance readings do not fall within range listed in steps 8 and 9, replace heat pump compressor motor.
11. If resistance readings fall within the range listed in steps 8 and 9, go to step 12.

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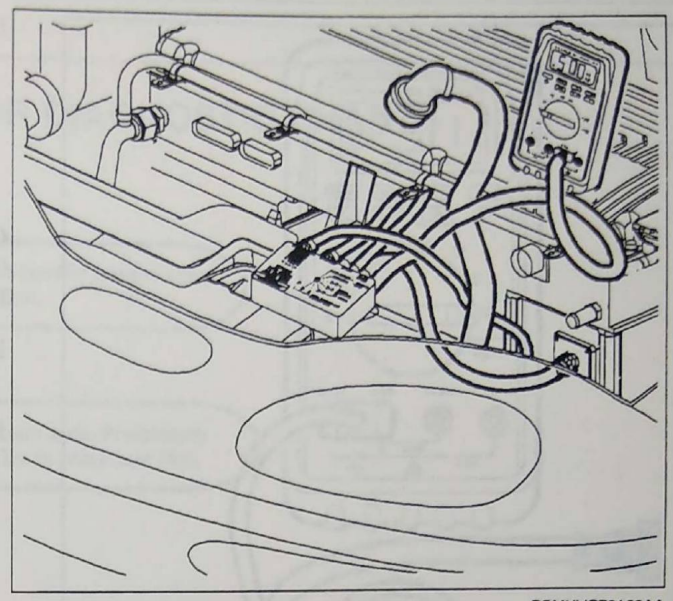
12- Install harness from EV9701Z (power steering - A/C compressor electrical tester) to the APM compressor cannon connector.

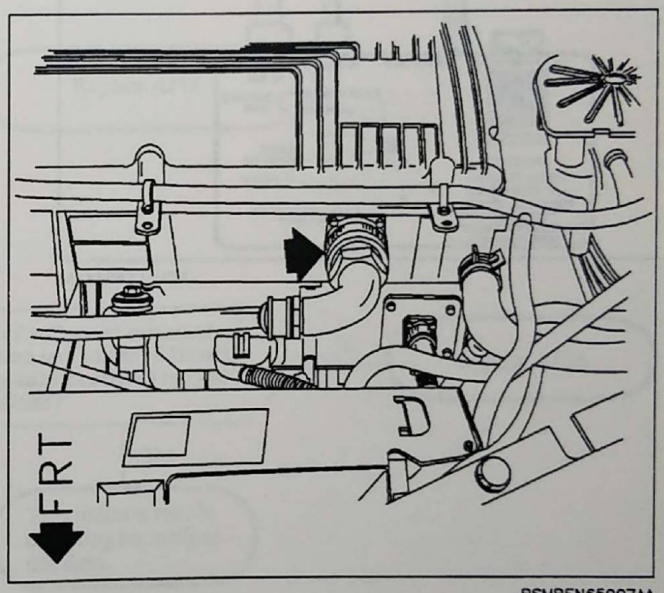
13 Set DVOM to the A/C voltage setting.



PSMHVC72162AA

IMPORTANT: Do not use any tools to reinstall the connector. Excessive force or misalignment can damage the connector.

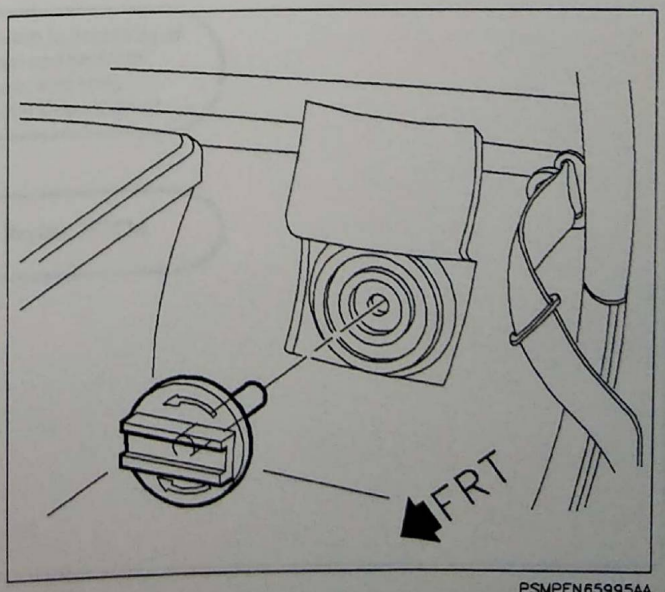
14. Reinstall the charge receptacle to PIM connector.



PSMPEN65997AA

15. Install the manual disconnect handle by pushing the shaft straight into the hole and turning clockwise.

15- Power vehicle up and clear BPM DTCs. If the vehicle does not power-up, refer to the “High Voltage” section of the Battery and Charging System service manual.



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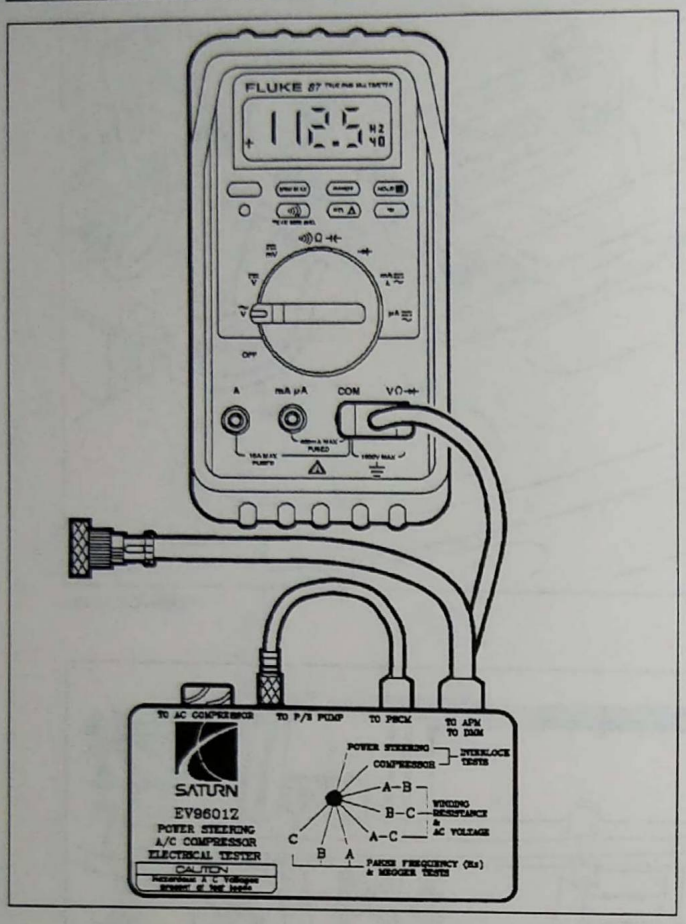

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17. Remove charge coupler if installed. Turn heat pum system to high (maximum heat if ambient temperature is below 19°C [66°F], maximum cool if ambient temperature is above 19°C [66'F1). Wait five minutes before taking any readings. This is necessary to allow system to stabilize.

CAUTION: THE EV9701Z POWER STEERING - A/C COMPRESSOR ELECTRICAL TESTER, LEADS AND DVOM MAY NOW CONTAIN UP TO 230 VOLTS A/C.

18. Measure A/C voltage at switch points A-B, B-C and A-C.

19. A/C voltage at switch points A-B, B-C, A-C should be within 10 volts A/C of each other. If they are not, replace the APM.

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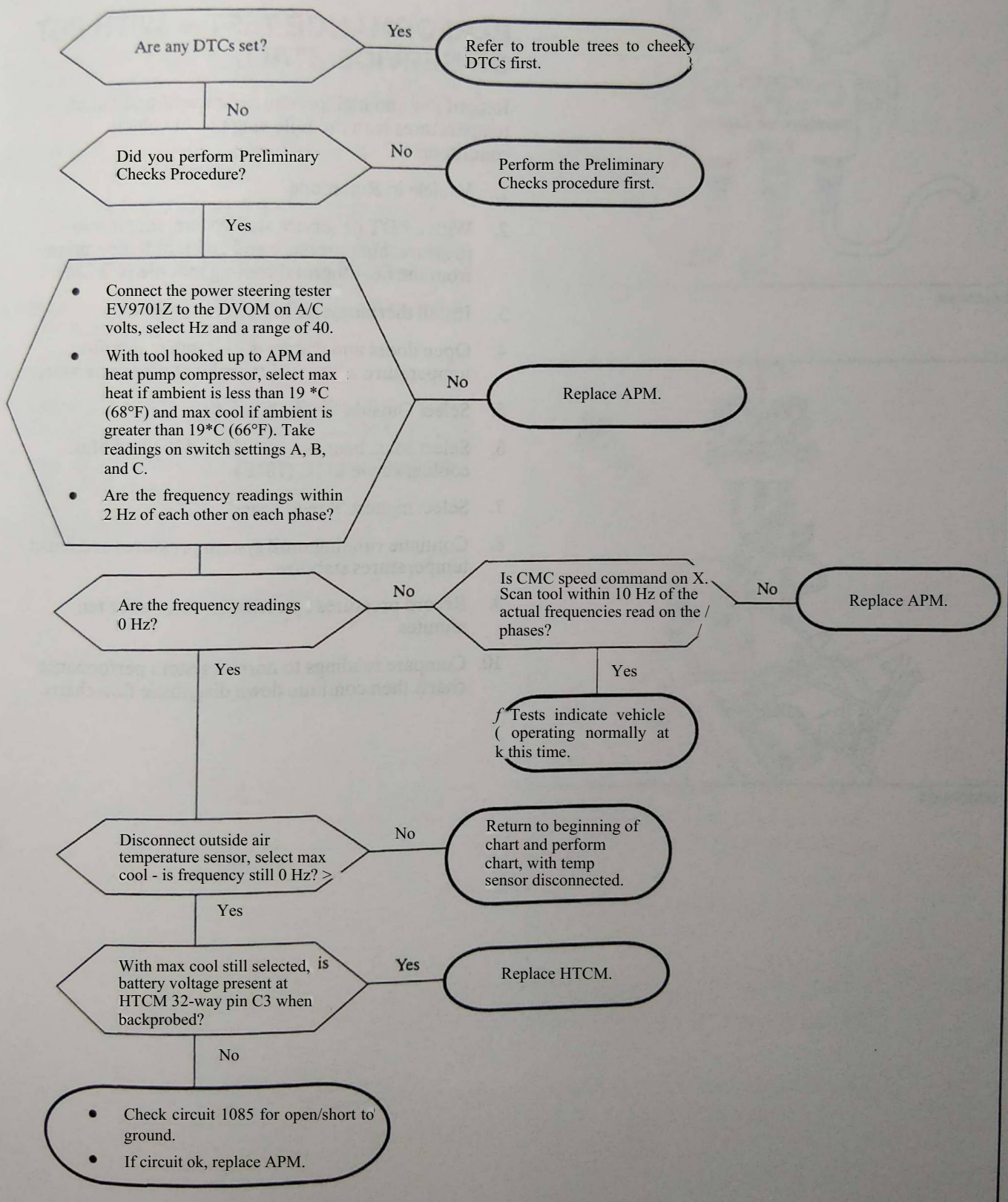
HEAT PUMP COMPRESSOR DIAGNOSTIC CHARTS


Are any DTCs set?
Yes
Refer to trouble trees to cheeky DTCs first.
No
Did you perform Preliminary Checks Procedure?
No
Perform the Preliminary Checks procedure first.
Yes
Connect the power steering tester EV9701Z to the DVOM on A/C volts, select Hz and a range of 40.
With tool hooked up to APM and heat pump compressor, select max heat if ambient is less than 19 *C (68°F) and max cool if ambient is greater than 19*C (66°F). Take readings on switch settings A, B, and C.
Are the frequency readings within 2 Hz of each other on each phase?
No
Replace APM.
Are the frequency readings 0 Hz?
No
Is CMC speed command on X. Scan tool within 10 Hz of the actual frequencies read on the / phases?
No
Replace APM.
Yes
Yes
Tests indicate vehicle operating normally at this time.
Yes
Disconnect outside air temperature sensor, select max cool - is frequency still 0 Hz? >
No
Return to beginning of chart and perform chart, with temp sensor disconnected.
Yes
With max cool still selected, is battery voltage present at HTCM 32-way pin C3 when backprobed?
Yes
Replace HTCM.
No
Check circuit 1085 for open/short to ground.
If circuit ok, replace APM.

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VEHICLE SET-UP

If an A/C system problem still exists after you have completed the preliminary checks, more diagnostics must follow. This includes the proper set-up on the vehicle prior to vehicle testing.

PERFORMANCE TEST - WITH PDT OR SERVICE STALL

Record low and high pressures, ambient and outlet temperatures with the following preset vehicle conditions:

1. Vehicle in Run mode.
2. With a PDT or service stall system, monitor low pressure, high pressure and ambient temperature from the heat thermal cooling module (HTCM).
3. Install thermometer in right center outlet.
4. Open doors and windows to stabilize interior temperature with outside ambient air temperature.
5. Select Outside air (Recirc Off).
6. Select Max. heat below 19°C (65°F) and Max. cooling above 21 °C (70°F).
7. Select highest blower speed.
8. Continue running until system pressures and outlet temperatures stabilize.
9. Record pressures and temperatures after ten minutes.
10. Compare readings to normal system performance charts then continue down diagnostic flow charts.

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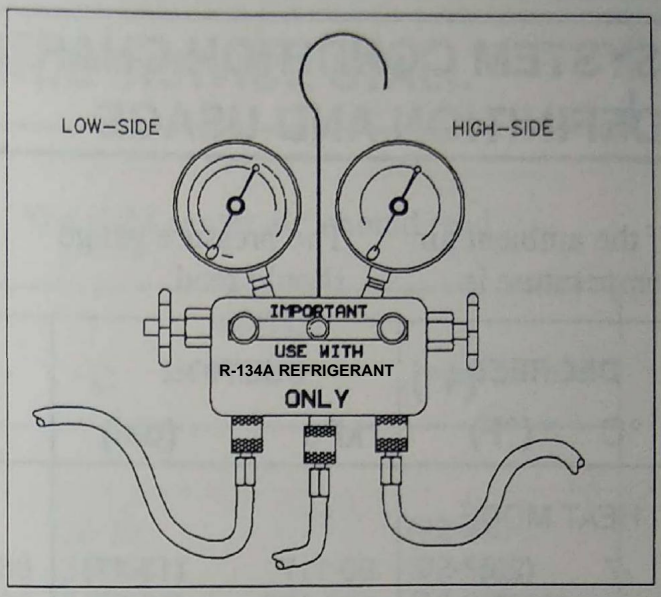
INSTALLING MANIFOLD GAUGE SET

If a PDT >s not ava>laWe or a pressure transducer is suspected of incorrect pressure readings, then the installation of a manifold gauge set will be necessary to perform the performance test. Follow the steps listed below for installing a manifold gauge set.

CAUTION: ALWAYS WEAR GOGGLES AND WRAP A CLEAN CLOTH AROUND FITTINGS, VALVES, AND CONNECTIONS WHEN PERFORMING WORK THAT INVOLVES OPENING THE REFRIGERANT SYSTEM.

IMPORTANT: Check to make sure gauges read zero before installing manifold gauge set.

1. Close both hand valves of the manifold gauge set.
2. Connect the low pressure (blue) gauge hose to the suction sendee port located on the suction pipe.
3. Pull valve assembly collar up, place valve assembly over service port and release collar.
4. Open service valve.
5. Connect the high pressure (red) gauge hose to the discharge service port located on the discharge pipe.
6. Pull valve assembly collar up, place valve assembly over service port and release collar.
7. Open service valve.



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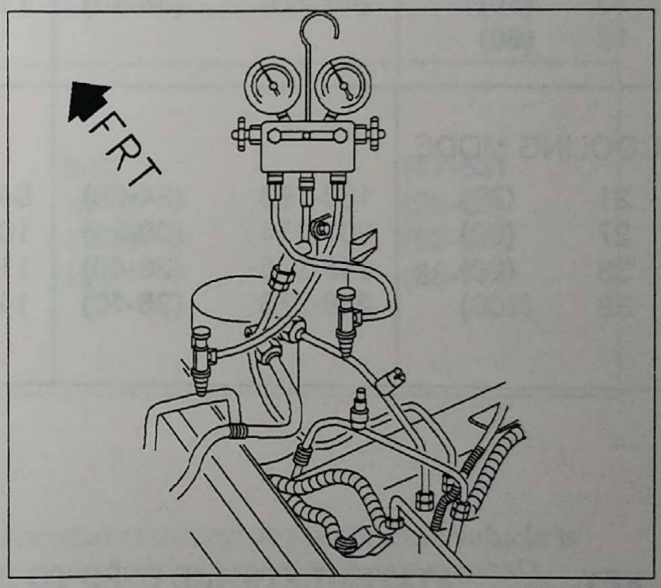

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SYSTEM CONDITION CHARTS

DEFINITION AND USAGE

If the ambient air temperature is ... The pressure gauge should read ... The pressure gauge should read ... The right center air should read ...

DEGREES °C	(°F)	SUCTION kPa	(psi)	DISCHARGE kPa	(Psi)	OUTLET °C	(°F)
HEAT MODE							
-7	(20)	90-117	(13-17)	869-896	(126-130)	28-30	(82-86)
-1	(30)	110-138	(16-20)	1034-1062	(150-154)	34-36	(92-96)
3	(38)	165-193	(24-28)	896-924	(130-134)	31-34	(88-92)
10	(50)	248-276	(36-40)	1165-1193	(169-173)	39-41	(101-106)
16	(60)						
COOLING MODE							
21	(70)	165-193	(24-28)	841-869	(122-126)	8-12	(47-53)
27	(80)	207-234	(30-34)	1020-1048	(148-152)	13-16	(56-60)
33	(90)	248-276	(36-40)	1165-1193	(169-173)	17-19	(62-66)
38	(100)	248-276	(36-40)	1482-1510	(215-219)	19-21	(66-70)

KEY: **STATEMENTS ARE USED TO INTERPRET THE PRESSURE AND TEMPERATURE READINGS COMPARED TO NORMAL SYSTEM PERFORMANCE. IF TESTING ABOVE OR BELOW AMBIENT TEMPERATURES LISTED, RELY ON KEY STATEMENTS TO DIAGNOSE SYSTEM.**

THEN: Statements contain additional information to help you confirm your diagnosis and lead you to a corrective action.

* When all pressure and temperature readings fall within the ranges of a given chart, use that chart to repair the vehicle.

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FORMAL SYSTEM PERFORMANCE SERVICE STALL

If the ambient aii temperature is . . . The right center air should read . . .

DEGREES °C	DEGREES (°F)	OUTLET °C	OUTLET (°F)
HEAT MODE			
-7	(20)	28-30	(82-86)
'W -1	(30)	34-36	(92-96)
3	(38)	31-34	(88-92)
10	(50)	39-41	(101-106)
16	(60)		
COOLING MODE			
21	(70)	8-12	(47-53)
27	(80)	13-16	(56-60)
33	(90)	17-19	(62-66)
38	(100)	19-21	(66-70)

IMPORTANT* To ensure accurate pressure and temperature readings make sure the vehicle is properly set up to run the performance test. (Refer to vehicle set up section in this manual). AH test parameters **must be followed to obtain accurate readings.**

Confirm system performance by touching the suction and discharge pipes at the compressor. The action pipe will be cold and the discharge pipe will be hot.

At temperatures above 19°C (66°F), the HVAC system will allow A/C only. Below 19°C (66°F), the HVAC system will allow heat pump only.

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NORMAL SYSTEM PERFORMANCE HIGH HUMIDITY

If the ambient air temperature is . .. The right center air should read ...

DEGREES °C	DEGREES (°F)	OUTLET °C	OUTLET (°F)
HEAT MODE Not Applicable			
COOLING MODE			
21	(70)	10-13	(50-55)
27	(80)	16-18	(61 -65)
33	(90)	22-25	(72-76)
38	(100)	28-30	(82-86)

- High humidity conditions affect system performance by increased heat load on the system. A relative humidity above 70 percent will be considered high humidity.
- This chart illustrates the effect high humidity has on the EVI air conditioning and heat pump system. Use this chart to determine normal system performance under high humidity conditions.
- As a general rule normal systems operating under high humidity conditions will produce an outlet temperature of at least 15°F below ambient air temperature.

• At temperatures above 19° C (66°F), the HVAC system will allow A/C only. Below 19°C (66°F), the HVAC system will allow heat pump only.

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GENERAL SYSTEM CONDITION - Low REFRIGERANT CHARGE

If the ambient air temperature is ... AND pressure gauge reads. .. AND pressure gauge reads.. . AND right center air reads . . .

DEGREES °C	(°F)	SUCTION kPa	(psi)	DISCHARGE kPa	(Psi)	OUTLET °C	(°F)
HEAT MODE							
-7	(20)	-28-7	H-1)	434-462	(63-67)	13-16	(55-60)
-1	(30)	-28-7	(-4-1)	448-476	(65-69)	14-17	(57-62)
3	(38)	0-34	(0-5)	469-496	(68-72)	16-18	(60-65)
10	(50)	0-34	(0-5)	558-586	(81-85)	20-23	(68-73)
16	(60)						
COOLING MODE							
21	(70)	165-193	(24-28)	572-607	(83-88)	16-19	(61-66)
27	(80)	165-193	(24-28)	648-676	(94-98)	21-24	(70-75)
33	(90)	165-193	(24-28)	738-765	(107-111)	27-30	(81-86)
38	(100)	165-193	(24-28)	869-896	(126-130)	28-31	(82-87)

KEY: **POOR COOLING AT HIGHER AMBIENTS.**
POOR HEATING AT LOWER AMBIENT.

THEN: System is operating with a low charge.

- Confirm by touching the suction and discharge pipes at the compressor. Suction pipe will be cool to warm and discharge p.pe will be warm to hot.
- Pine temneratures will vary with ambient air temperature and the amount of ripe temperature. y tPm neratures will be warmer in air conditioning charge lost. Suction and outlet temperatures wu mode and cooler in·heat pump mode as more refrigerant is lost.
- The pressures are not absolute and snoui and should be used as a guide in diagnosis.
- Leak test all components and connections.
- , • vnnwn reclaim, evacuate, change valve cores and
- If refrigerant charge level is un ' Ri34-a. recharge system with 0.91 kg (2.0 s.) lb of
- Run another performance test.

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GENERAL SYSTEM CONDITION - LOW SIDE RESTRICTIONS

If the ambient air AND pressure temperature is . .. gauge reads. ..

AND pressure gauge reads . ..

AND right center air reads . ..

DEGREES °C	(°F)	SUCTION kPa	(psi)	DISCHARGE kPa	(psi)	OUTLET °C	(°F)
HEAT MODE							
-7	(20)	83-117	(12-17)	855-883	(124-128)	27-30	(81-86)
-1	(30)	124-152	(18-22)	1069-1096	(155-159)	34-37	(93-98)
3	(38)	172-200	(25-29)	938-965	(136-140)	32-35	(90-95)
10	(50)	234-262	(34-38)	1083-1110	(157-161)	37-40	(98-103)
16	(60)						
COOLING MODE							
21	(70)	234-262	(34-38)	772-800	(112-116)	12-15	(53-58) |
27	(80)	228-255	(33-37)	1014-1041	(147-151)	14-17	(57-62) 1
33	(90)	310-338	(45-49)	1076-1103	(156-160)	19-22	(66-71)
38	(100)	255-262	(37-42)	1289-1317	(187-191)	18-21	(65-70) i

KEY: **TEMPERATURE DROP ACROSS RESTRICTION IN LINE OR COMPONENT.**

THEN: Confirm condition by a thorough physical and visual inspection of all lines and components.

- Temperature will be much colder on the down stream side of the restriction.
- The pressures are not absolute and should be used as a guide in diagnosis.
- Replace the restricted part.
- After repair return to diagnostic flow chart.

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GENERAL SYSTEM CONDITION - HIGH SIDE RESTRICTIONS

If the ambient air temperature is ... AND pressure gauge reads. . . AND pressure gauge reads . . . AND right center air reads . ..

DEGREES °C	(°F)	SUCTION kPa	(Psi)	DISCHARGE kPa	(psi)	OUTLET °C	(°F)
* HEAT MODE							
-7	(20)	83-117	(12-17)	855-883	(124-128)	27-30	(81-86)
-1	(30)	124-152	(18-22)	1069-1096	(155-159)	34-37	(93-98)
3	(38)	172-200	(25-29)	924-952	(134-138)	33-36	(91-96)
10	(50)	221 -248	(32-36)	1069-1096	(155-159)	35-38	(95-100)
16	(60)						
COOLING MODE							
21	(70)	186-214	(27-31)	800-827	(116-120)	10-13	(50-55)
27	(80)	200-228	(29-33)	1027-1055	(149-153)	13-16	(55-60)
33	(90)	228-255	(33-37)	1165-1193	(169-173)	16-18	(60-65)
38	(100)	228-255	(33-37)	1434-1462	(208-212)	18-21	(65-70)

KEY: **TEMPERATURE DROP ACROSS RESTRICTION IN LINE OR COMPONENT.**

THEN: Confirm condition by a thorough physical and visual inspection of all lines and components.

- If restriction is between the compressor and the condenser, discharge pressure will be higher than normal.
- Temperature will be much colder on the down stream side of the restriction. Also look for possible frost.
- The pressures are not absolute and should be used as a guide in diagnosis.
- Replace the restricted part.
- After repair return to diagnostic flow chart.

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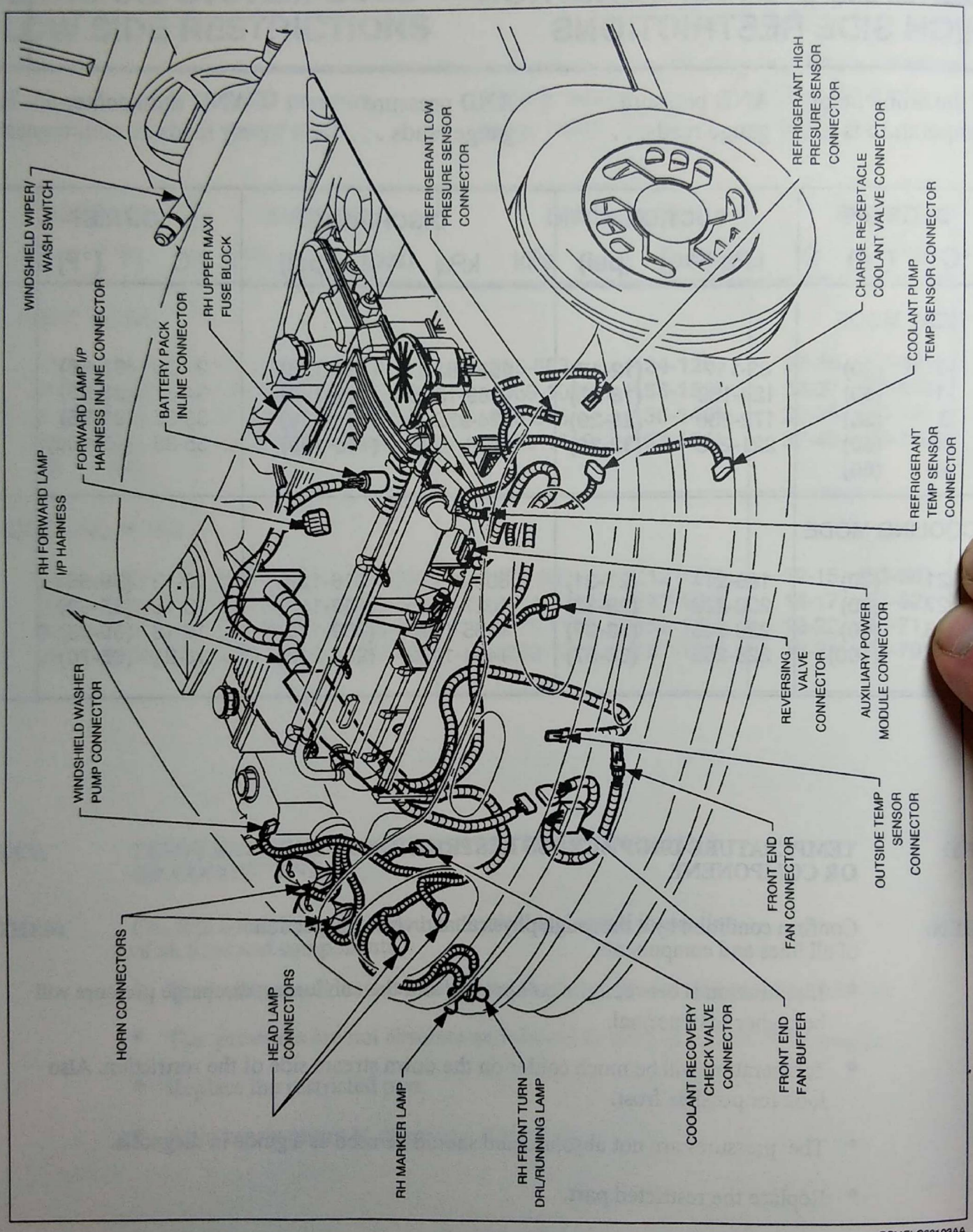
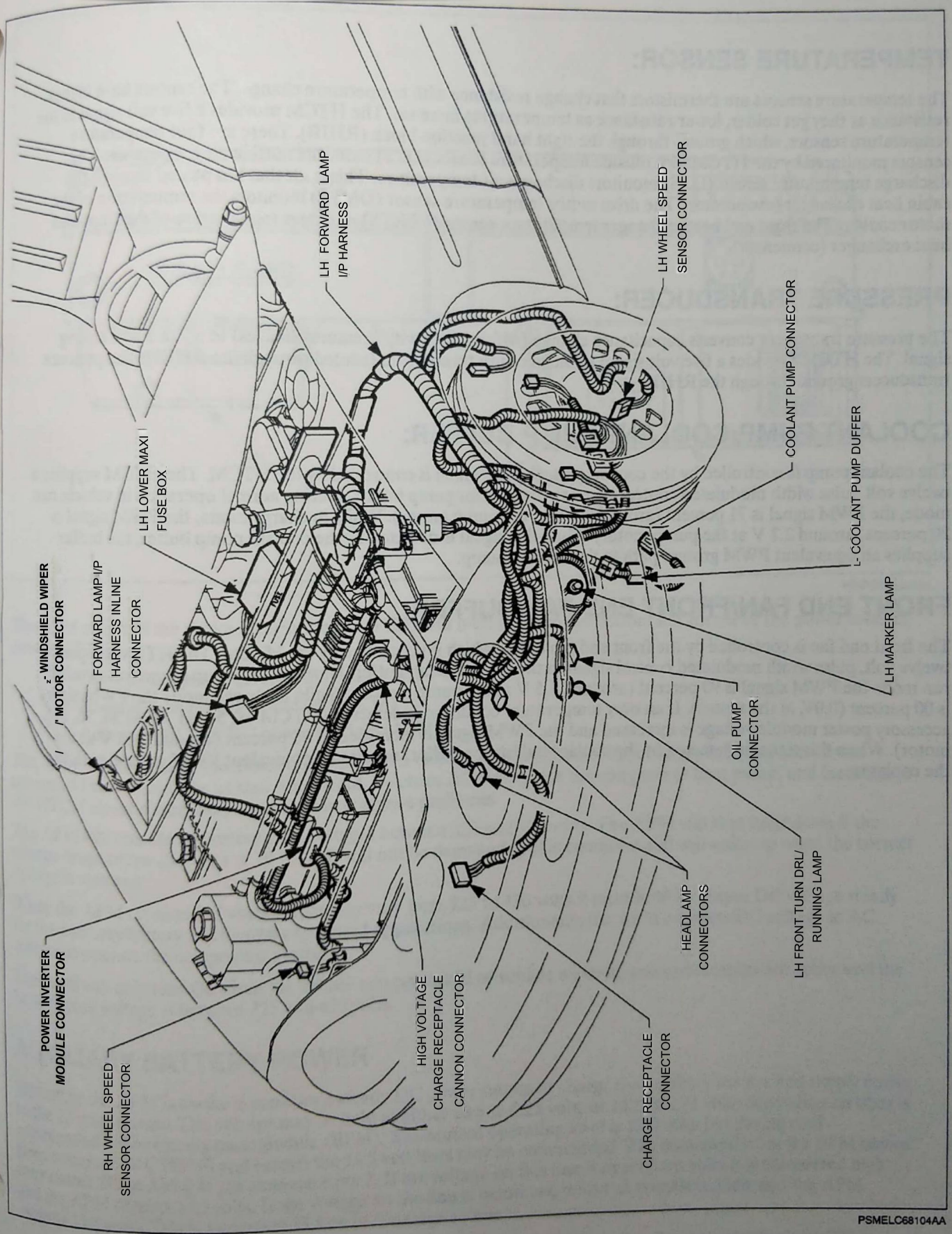
CLIMATE CONTROLS LOCATION VIEWS


WINDSHIELD WIPER/ WASH SWITCH
FORWARD LAMP I/P HARNESS INLINE CONNECTOR
BATTERY PACK INLINE CONNECTOR
RH UPPER MAXI FUSE BLOCK
REFRIGERANT LOW PRESURE SENSOR CONNECTOR
REFRIGERANT HIGH PRESURE SENSOR CONNECTOR
CHARGE RECEPTACLE COOLANT VALVE CONNECTOR
COOLANT PUMP TEMP SENSOR CONNECTOR
RH FORWARD LAMP I/P HARNESS
REFRIGERANT TEMP SENSOR CONNECTOR
WINDSHIELD WASHER PUMP CONNECTOR
AUXILIARY POWER MODULE CONNECTOR
REVERSING VALVE CONNECTOR
OUTSIDE TEMP SENSOR CONNECTOR
FRONT END FAN CONNECTOR
HORN CONNECTORS
HEAD LAMP CONNECTORS
COOLANT RECOVERY CHECK VALVE CONNECTOR
FRONT END FAN BUFFER
RH MARKER LAMP
RH FRONT TURN DRL/RUNNING LAMP
PSMELC68103AA


POWER INVERTER
MODULE CONNECTOR
RH WHEEL SPEED
SENSOR CONNECTOR
WINDSHIELD WIPER
MOTOR CONNECTOR
FORWARD LAMP I/P
HARNESS INLINE
CONNECTOR
LH LOWER MAXI
FUSE BOX
LH FORWARD LAMP
I/P HARNESS
HIGH VOLTAGE
CHARGE RECEPTACLE
CANNON CONNECTOR
CHARGE RECEPTACLE
CONNECTOR
HEADLAMP
CONNECTORS
LH FRONT TURN DRL/
RUNNING LAMP
OIL PUMP
CONNECTOR
LH WHEEL SPEED
SENSOR CONNECTOR
COOLANT PUMP CONNECTOR
COOLANT PUMP DUFFER
LH MARKER LAMP
PSMELC68104AA

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HTCM GENERAL DESCRIPTION

TEMPERATURE SENSOR:

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HTCM provides a five volt signal to the temperature sensors, which ground through the right hand junction block (RHJB). There are four temperature sensors monitored by the HTCM.The outside temperature sensor (OTS) monitors outside air temperature.The discharge temperature sensor (DTS) monitors discharge air temperature. This is air that has passed through the cabin heat exchanger (evaporator).The drive motor temperature sensor (DMTS) monitors the temperature of the motor coolant.The front end heat exchanger temperature sensor (FEXTS) monitors temperature of the front end heat exchanger (condenser).

PRESSURE TRANSDUCER:

The pressure transducer converts capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The HTCM provides a five volt signal to the pressure transducers (routed through the RHJB). The pressure transducers ground through the RHJB.

COOLANT PUMP/COOLANT PUMP BUFFER:

The coolant pump is controlled by the coolant pump buffer which is controlled by the HTCM. The HTCM supplies a twelve volt pulse width modulated control signal to the coolant pump buffer. During normal operation in vehicle run mode, the PWM signal is 71 percent (around 9.4 V at the pump motor). While in charge mode, the PWM signal is 20 percent (around 2.7 V at the pump motor).When this signal is detected by the coolant pump buffer, the buffer supplies an equivalent PWM ground path to the coolant pump.

FRONT END FAN/FRONT END FAN BUFFER:

The front end fan is controlled by the front end fan buffer which is controlled by the HTCM. The HTCM supplies a j twelve volt, pulse width modulated control signal to the front end fan buffer. During heat pump operation in vehicle I run mode the PWM signal is 90 percent (around 12.5 V at the pump motor). While in charge mode the PWM signal j is 00 percent (0.0V, at the motor). If an over temperature condition is detected (HTCM 48, 50, 51, PCM 34, 36, 37), i accessory power module voltage is increased and the PWM signal is increased to 98 percent (around 14.4 V at the 1 motor). When this signal is detected by the coolant buffer, the buffer supplies an equivalent PWM ground path to the coolant.

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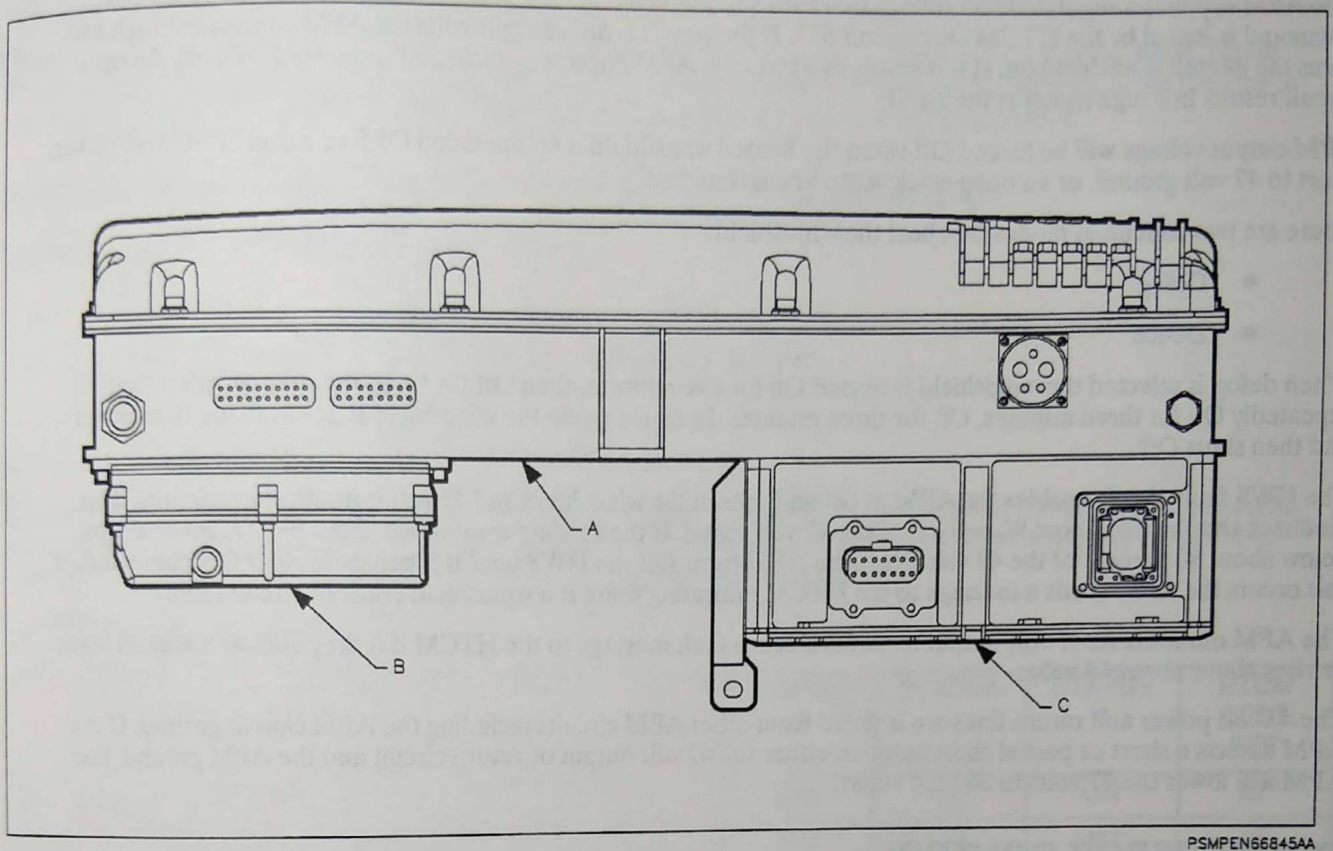
ACCESSORY AC AND DC POWER MODULE (APM)



PSMPEN66845AA

The APM is part of the power electronics bay (PEB) and is attached to the bottom left corner of the power inverter module (PIM).

A: Drive motor power inverter module (PIM)

B: Power steering control module (PSCM)

C: Accessory AC and DC power module (APM)

The APM has four major functions; it provides 13.5 or 14.5 volts DC for auxiliary battery charging and 12 volt systems, 47 volt DC for the heated windshield, 3−phase AC voltage for the compressor heat pump, and feedback to the HTCM about system operation to help diagnose problems

The APM will operate on battery pack voltage between 225 and 430 volts. The APM will shut itself down if the voltage drops below 225 volts ±10 volts. It will not be damaged by this condition and will wake-up when the correct voltage is restored.

While the APM receives DC voltage that may vary from 225 to 430 volts it must hold its output DC voltage steady for the auxiliary battery and heated windshield applications. Additionally, the APM converts DC voltage to AC voltage to operate the compressor motor.

The APM will only turn On when the vehicle run command or vehicle wake-up command inputs are active and the battery pack voltage is between 225 and 430 volts.

AUXILIARY BATTERY POWER

Meneverthe APM is awake ir provides a stei^yDCpawcrsource^o charge the wmlwy^bMte^and^sup^>lypoww to the 1 may be hel at either 13.5 ± 0.2 vol or 14.5 ± 0.25 v lts d ending n what is com ^7° 1 systems- Th*s v°laSe / p, \ The normal operating level is 13.5 volts but during cold e ba ry pack module (low) the 14.5 volt "vel ma> be “m ”’andei Thc “ Tv'0 ’^ Tr over circuit 249 to APM 24 pin connector pin 2 «:» 9 if the voltage on this line is over seven volts it is considered high and the APM outputs 14.5 volts. If the voltage on the line is below two volts considered low and the APM Outputs 13.5 volts This is a constant 13.5 or 14.5 voltage source.

The APM- u. , on owtncnf current as long as the battery pack voltage level is between 225 and 430 Volts TK ab^0UtpUt UP h° 1 nwer at 85 percent efficiency in the normal range of 250 - 390 volts and at least 80 Rc ThE^BffEr's Out thlS P percent efficiency over the entire range of 225 - 430 volts under moderately heavy loads.

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HEATED WINDSHIELD (HWS) CONTROL

The APM supplies a regulated DC voltage of 47 volts to the HWS upon a HWS ON command. The HWS ON command is issued by the HTCM over circuit 637. If the circuit is above eight volts the APM considers it high and turns the heated windshield on. If it is below two volts the APM considers it low and turns the HWS off. An open circuit results in a high signal at the APM.

APM output voltage will be turned Off when the heated windshield is commanded OFF or a short to 47 volt power, short to 47 volt ground, or an open crack sense line is detected.

There are two command modes that heat the windshield:

- Defog
- De-ice

When defog is selected the windshield is turned On for five minutes, then Off for three minutes and after that repeatedly On for three minutes, Off for three minutes. In de-ice mode the windshield is powered for 10 minutes and then shuts Off.

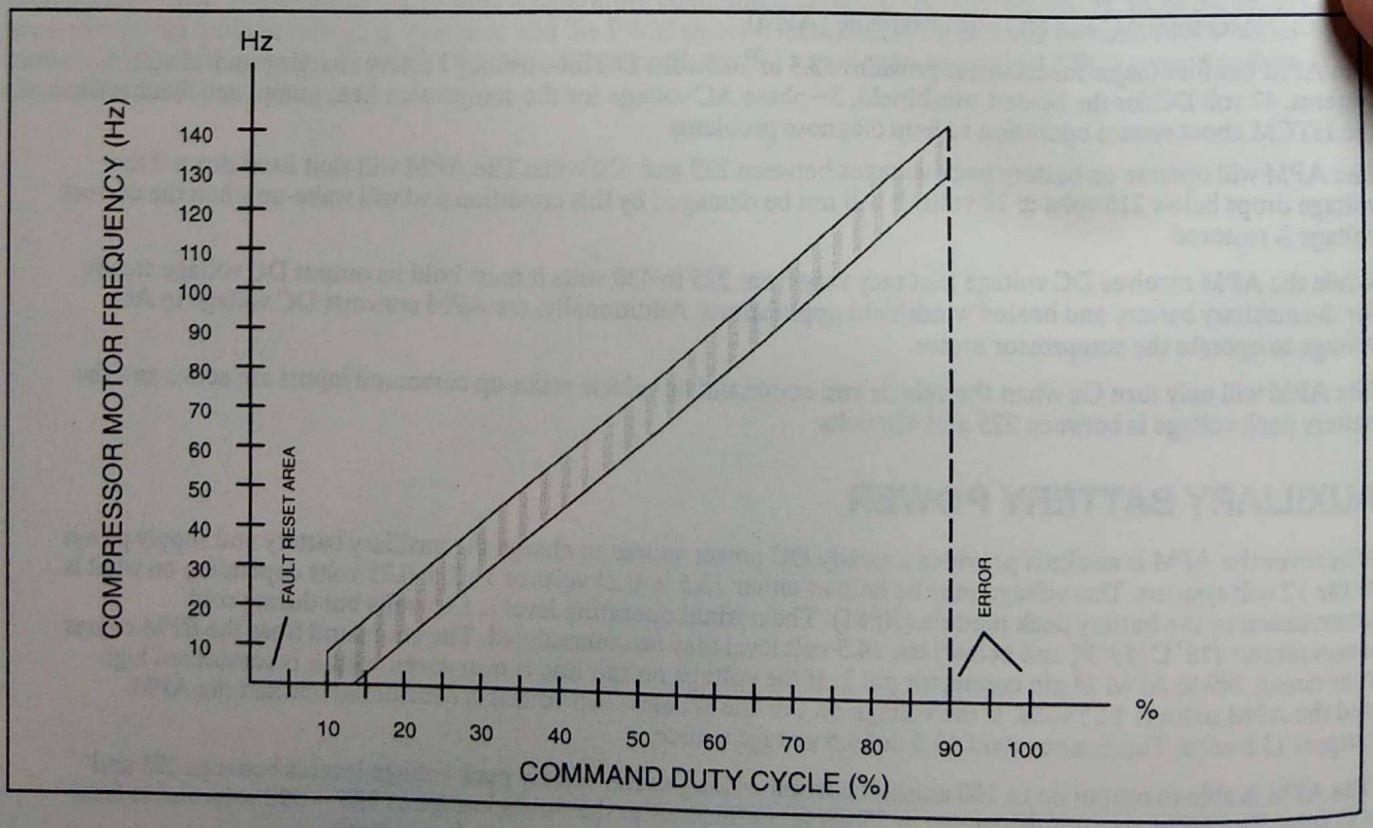
The HWS fault circuit enables the APM to detect faults in the windshield and 47 volt output/return circuits. This feedback should read about 92 percent of the 47 volt signal. If the reading rises above about 96 percent or drops below about 80 percent of the 47 volt signal the APM turns Off the HWS until it receives another ON command. If this occurs the APM sends a message to the HTCM indicating there is a windshield crack or circuit fault.

The APM monitors its 47 volt output circuit and sets a fault message to the HTCM if it drops below about 38 volts, or rises above about 64 volts.

The 47 volt power and return lines are isolated from other APM circuits including the APM chassis ground. If the APM detects a short or partial short between either the 47 volt output or return circuit and the APM ground, the APM will lower the 47 volts to 38 (± 4 volts).

COMPRESSOR CONTROL

The APM receives a pulse width modulated (PWM) signal from the HTCM that is used to control the frequency of IM the three phase AC output voltage for the compressor. The output frequency varies based on the duty cycle from the HTCM as shown in the table below.



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nnyvcr to the compressor is monitored and limited bv the APM/PTO ♦ u I ..
Th^ ? ic s signal to the HTCM indicating hnw M.I EB to help provide overload protection. The ^pM $^n . . . . j. APM jii | . ^ T Powcr compressor motor is drawing/being fed. If an over current condition is detected the Ar M will limit the output power to the compressor motor.

5 There is an interlock emeuit tha^ from the APM through the compressor motor and back to the APM. Inside the compressor this loop passes through a normally closed temperature switch. If there is an open in the line due to a disconnect or an overheat in the compressor the APM turns Off the power to the compressor.

APM STATUS MESSAGES AND LOAD SHED COMMAND

The APM reports to the HTCM over seven status lines;

- Three regarding APM operation and 12 volt status.
- Three regarding HWS and compressor operation and faults.
- One for the load shed command.

The state of these status lines is available over HTCM serial data.

The following tables show the state of the lines from the APM to the HTCM for the given conditions. For the APM to recognize one of the inputs as being ON the voltage on the line must be between 0 and 1 volts. For the APM to recognize one of the inputs as being OFF the line must be between 8 and 16 volts.

12 VOLT STATUS LINES

CONDITION	STATUS 2	STATUS 1	STATUS 0	HTCM CODE SET
APM disabled or APM off	ON	ON	ON	27
APM over-temperature (shutdown)	ON	ON	OFF	46
12 volt voltage > 16 volt OR 12 volt voltage < 10.5 volt and 12 volt current < 100 amps	ON	OFF	ON	37
12 volt voltage < 10.5 volt	ON	OFF	OFF	38
12 volt voltage < 13.25 volt and 12 volt current < 100 amps	OFF	ON	ON	39
12 volt current > 100 amps (maintain until current < 70 amps)	OFF	ON	OFF	NONE
Unused	OFF	OFF	ON	N/A
Normal operation	OFF	OFF	OFF	N/A

HWS AND COMPRESSOR STATUS LINES

CONDITION	STATUS 2	STATUS 1	STATUS 0	HTCM CODE SET
Cocked windshield or open windshield connector	ON	ON	ON	28
T^LB^isoTation < 75kO ± 250 ~~	ON	ON	OFF	41
voltage < 45,5 volt or 47 volt	ON	OFF	ON	42
Normal operation or not requested	ON	OFF	OFF	NONE
CMC iGBT Tjyr Tault (shutdown compressor)	OFF	ON	ON	29 OR 30
(shutdown compressor)	OFF	ON	OFF	31
Compressor interlock open due to motor overtemp or compressor not engaged.	OFF	OFF	ON	32
CMC function: normal operation or not requested	OFF	OFF	OFF	NONE

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IMPORTANT: The HTCM DTCs set as a result of the APM status feedback, result in a variety of actions by the HTCM depending on the failure. Refer to the appropriate codes in the HVAC electrical service manual for more information on these DTCs.

LOAD SHED COMMAND

The APM will command load shed to the HTCM whenever its 12 volt output to the auxiliary battery falls below 10.5 volts and the service brake is applied. The HTCM responds to this command by turning Off power to the rear defogger and the blower for the duration of the command. Whenever a load shed command is received by the HTCM it sets a DTC 37 and sets output bit APS failure. This informs the BPM to disable the battery pack fan. Disabling these loads helps assure adequate power is available for braking. As soon as the brake is released or the 12 volt supply rises above 10.5 volts the load shed command is turned Off.

APM WAKEUP/RUN

The APM turns On when its wakeup circuit is pulled high (12 volts). The wakeup circuit can be asserted (pulled high) by the BPM, HTCM, battery recovery switch, or when the charge coupler is inserted into the charge receptacle.

The APM will also turns On when the RSA asserts Run 2 to the APM.

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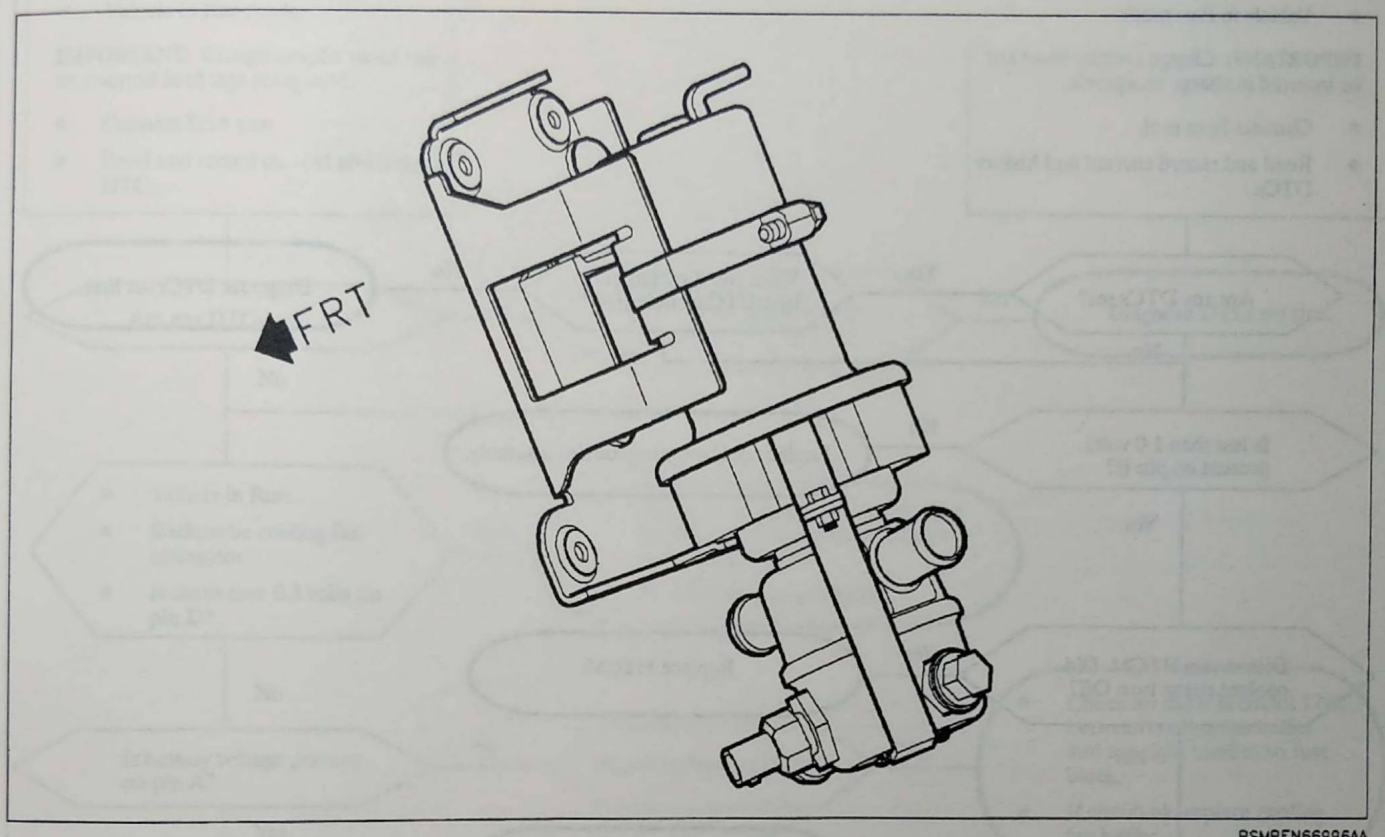
GENERAL DESCRIPTION

WATER PUMP ASSEMBLY



PSMPEN66996AA

The water pump assembly consists of three major components, the electric water pump motor, the water pump and the water pump manifold.

The electric water pump motor is a 12 volt pulse width modulated DC motor that is controlled by the heat pump ventilation system/thermal control module (HTCM), based on coolant temperature sensor readings from the power electronics bay (PEB), drive unit, water pump manifold and battery pack module (BPM) requests. Pulse width modulation allow the HTCM to run the water pump motor from 5 volts to 14 volts, this controls the coolant flow rate and maintains the optimal coolant temperature eliminating the need for a thermostat with in the coolant system. Pulse width modulation also allows the electric water pump to soft start the motor which reduces current surge and increases motor life.

The water pump is driven by the electric water pump motor and distributes the coolant through the cooling system. The water pump is a compact close tolerance impeller type pump.

The water pump manifold has several functions, zero pressure loss return for radiator and heater, vents to expansion tank to prevent cavitation, houses a coolant temperature sensor, two way feed to coolant vessel which maintains the coolant level during the fill procedure, venting and pressure relief. The water pump manifold drain plug is the main drain path for the coolant system drain procedure.

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CHART 1
COOLANT PUMP STAYS ON

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history DTCs.

Are any DTCs set? — Yes → Were you directed here by a DTC trouble tree? — No → C Diagnose DTCs set first.

Were you directed here by a DTC trouble tree? — I Yes → <

Are any DTCs set? — No → <

Is less than 1.0 volts present on pin B? — No → X;----------X 1 Replace coolant pump/buffer assembly, *j*

Is less than 1.0 volts present on pin B? — Yes

Disconnect HTCM. Did coolant pump turn Off? — Yes → Replace HTCM.

Disconnect HTCM. Did coolant pump turn Off? — No

Disconnect LHJB J9 connector. Did coolant pump shut Off? — Yes →
- Check for short to ground in circuit 2014B.
- If circuit ok, replace RHJB.

Disconnect LHJB J9 connector. Did coolant pump shut Off? — No

Disc RHJB J2 connector. Did coolant pump shut Off? — No →
- Check for short to ground in circuit 2014c.
- If circuit ok, replace coolant pump/buffer assembly..

Disc RHJB J2 connector. Did coolant pump shut Off? — Yes →

- Check for short to ground in circuit 2014A.
- If circuit ok, replace LHJB.

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CHART 2
COOLING FAN INOPERATIVE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history DTCs.

Are any DTCs set? — Yes → Were you directed here by a DTC trouble tree? — No → Diagnose DTCs set first.

Are any DTCs set? — No → Yes → Were you directed here by a DTC trouble tree?

- Vehicle in Run.
- Backprobe cooling fan connector.
- Is there over 0.3 volts on pin D?

No →
- Check for poor ground circuit 350F between cooling fan buffer pin D and LHJB J5 pin A.
- If circuit ok, replace RHJB.

Yes →

Is battery' voltage present on pin A? — No → <^Ts cooling fan fuse blown?^^> — Yes →
- Check for short in circuit 1742 between cooling fan buffer and top right hand maxi fuse block.
- If circuit ok, replace cooling fan buffer

No → Check for open in circuit 1742 between cooling fan buffer and top right hand *J* maxi fuse block.

Yes →

Is battery voltage present on pin C in run mode? — No →
- Check for open in circuit 7H between cooling fan buffer pin C and RHJB J2 pin A8.
- If circuit ok, replace RHJB.

Yes →

Is pin B showing less than 1.0 volts? — Yes → ■^^Replace cooling fan/buffer assembl^

No →

- Disconnect HTCM.
- Does pin C13 show battery volts?

Yes → Replace HTCM?

No →
- Check for open in circuit 335.
- If circuit ok, replace cooling fan/buffer assembly.

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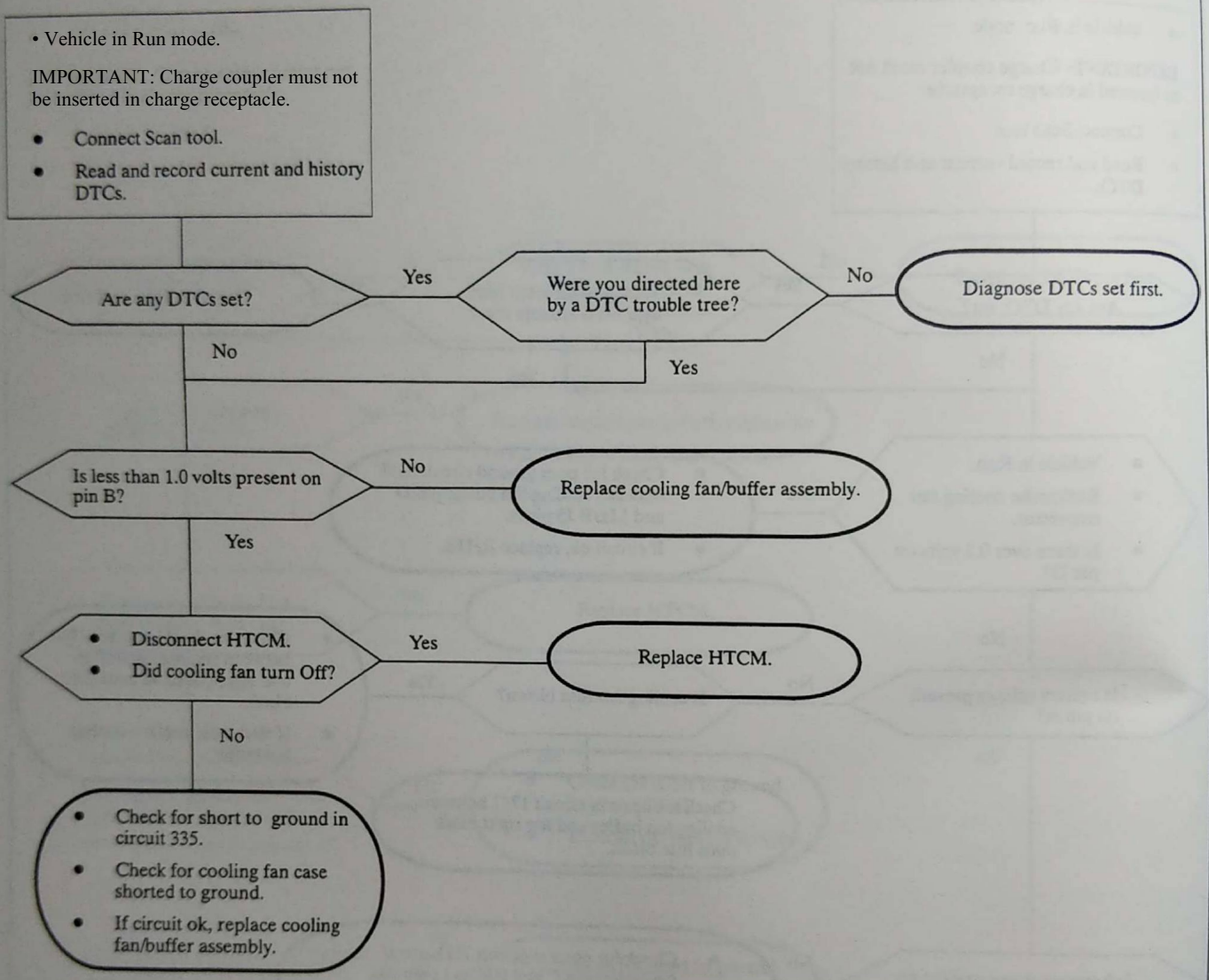
CHART 3
COOLING FAN STAYS ON


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history DTCs.
Are any DTCs set?
Yes
Were you directed here by a DTC trouble tree?
No
Diagnose DTCs set first.
No
Yes
Is less than 1.0 volts present on pin B?
No
Replace cooling fan/buffer assembly.
Yes
• Disconnect HTCM.
• Did cooling fan turn Off?
Yes
Replace HTCM.
No
• Check for short to ground in circuit 335.
• Check for cooling fan case shorted to ground.
• If circuit ok, replace cooling fan/buffer assembly.

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NOTES

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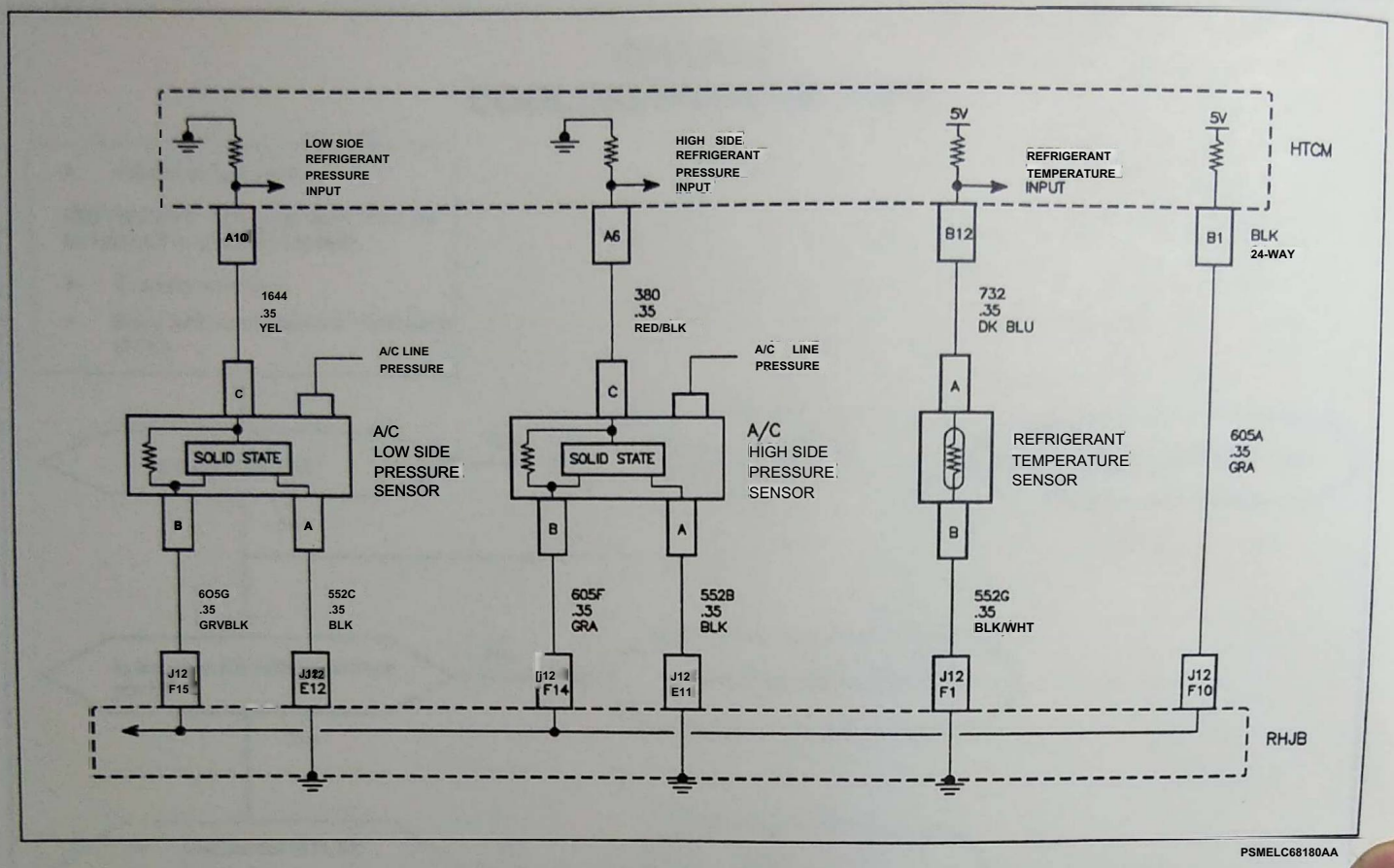
DTC 10 - HIGH SIDE PRESSURE TRANSDUCER OPEN/SHORT



PSMELC68180AA

HIGH SIDE PRESSURE TRANSDUCER OPEN/SHORT

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The HPVS/thermal control module (HTCM) monitors input from the transducers. The sensor can measure a range from 0.23 volts (20 kPa) to 4.9 volts (2800 kPa). If the input goes outside the normal range, this fault will be set and the heat pump will be disabled.

DTC PARAMETERS

DTC 10 will set if:

- Open or short to ground or voltage in the high side transducer circuit.
- Faulty transducer.
- HTCM failure.

DTC 10 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts or more than 4.9 volts on the high side transducer input circuit.

FAILURE ACTION

Heat pump operation will be disabled.

RELATED DTCS

HTCM 053

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC 10
HIGH SIDE PRESSURE TRANSDUCER OPEN/SHORT

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Are HTCM DTCs 11, 18, 22, 58, and 62 set?
- Yes → Go to chart 10A.
- No →

Clear HTCM DTCs, then cycle vehicle Off and back On. Does the DTC reset?
- No → Problem is intermittent. Refer to Diagnostic Aids.
- Yes →

Backprobe HTCM 24 pin connector pin A6 - is there less than 0.10 volts?
- No → Is there over 4.9 volts?
  - No → Replace HTCM.
  - Yes →
- Yes →

Disconnect Hi side pressure sensor connector. Is there still over 4.9 volts at HTCM pin A6?
- No → Replace Hi side pressure sensor.
- Yes →

- Check for short to voltage on circuit 380.
- If circuit ok, replace HTCM.

Disconnect Hi side pressure sensor. Is there over 4.8 volts on pin B of connector?
- No →
  - Check for open in circuit 605F between high side pressure sensor and LHJB.
  - If circuit ok, replace LHJB.
- Yes →

Is resistance to ground at pin C of connector over 60k ohms?
- Yes →
  - Check for open in circuit 380.
  - If circuit ok, replace HTCM.
- No →

Is resistance to ground at pin C under 10k ohms?
- Yes →
  - Check for short to ground in circuit 380.
  - If circuit ok, replace HTCM.
- No →

Is resistance to ground at pin A under 2.0 ohms?
- No →
  - Check for open in circuit 552B.
  - If circuit ok, replace RHJB.
- Yes →

Replace high side pressure sensor.

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DTC 10A
HIGH SIDE PRESSURE TRANSDUCER OPEN/SHORT (CONTINUED)

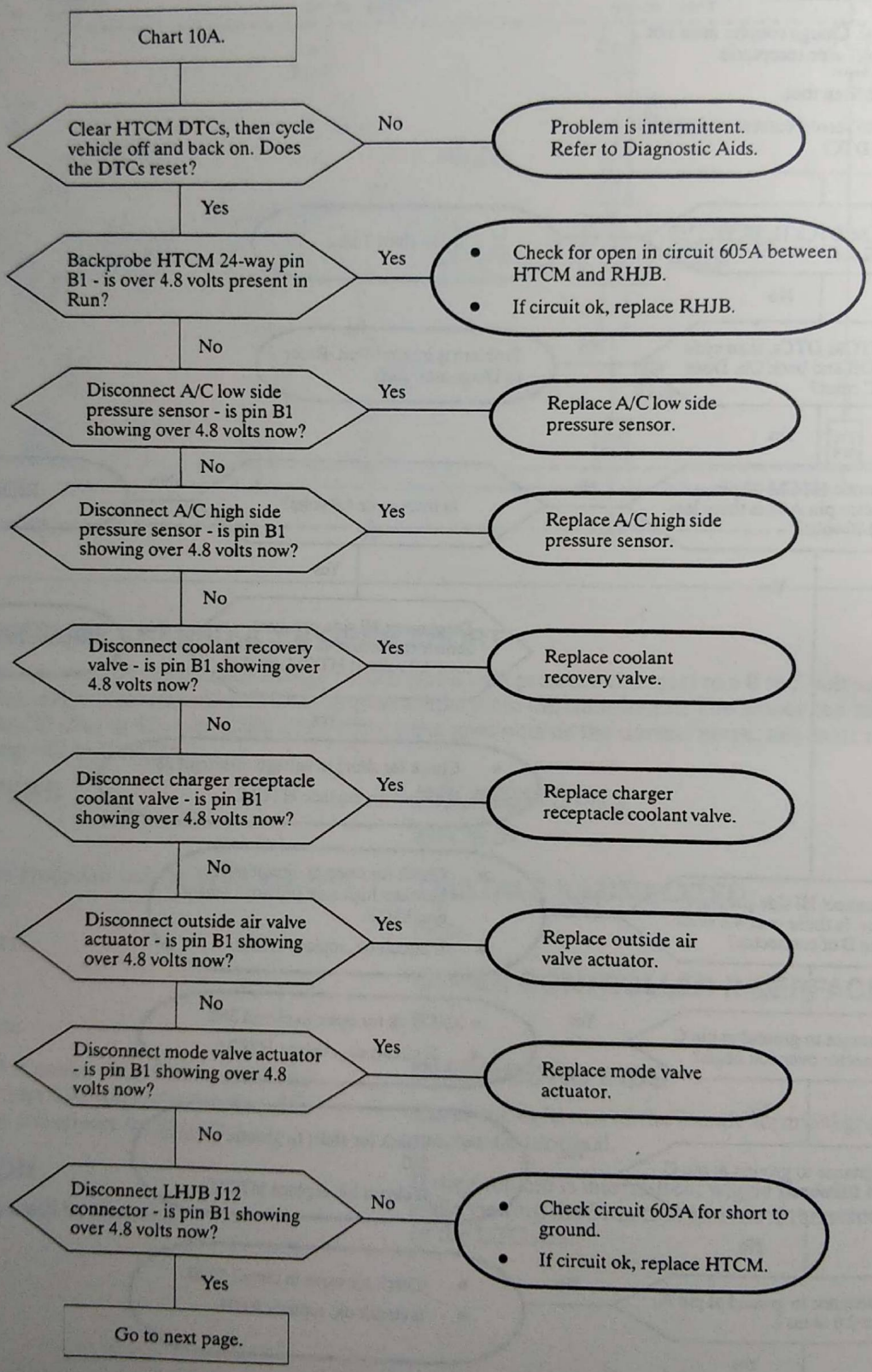
Chart 10A.
Clear HTCM DTCs, then cycle vehicle off and back on. Does the DTCs reset?
No
Problem is intermittent. Refer to Diagnostic Aids.
Yes
Backprobe HTCM 24-way pin B1 - is over 4.8 volts present in Run?
Yes
• Check for open in circuit 605A between HTCM and RHJB.
• If circuit ok, replace RHJB.
No
Disconnect A/C low side pressure sensor - is pin B1 showing over 4.8 volts now?
Yes
Replace A/C low side pressure sensor.
No
Disconnect A/C high side pressure sensor - is pin B1 showing over 4.8 volts now?
Yes
Replace A/C high side pressure sensor.
No
Disconnect coolant recovery valve - is pin B1 showing over 4.8 volts now?
Yes
Replace coolant recovery valve.
No
Disconnect charger receptacle coolant valve - is pin B1 showing over 4.8 volts now?
Yes
Replace charger receptacle coolant valve.
No
Disconnect outside air valve actuator - is pin B1 showing over 4.8 volts now?
Yes
Replace outside air valve actuator.
No
Disconnect mode valve actuator - is pin B1 showing over 4.8 volts now?
Yes
Replace mode valve actuator.
No
Disconnect LHJB J12 connector - is pin B1 showing over 4.8 volts now?
No
• Check circuit 605A for short to ground.
• If circuit ok, replace HTCM.
Yes
Go to next page.

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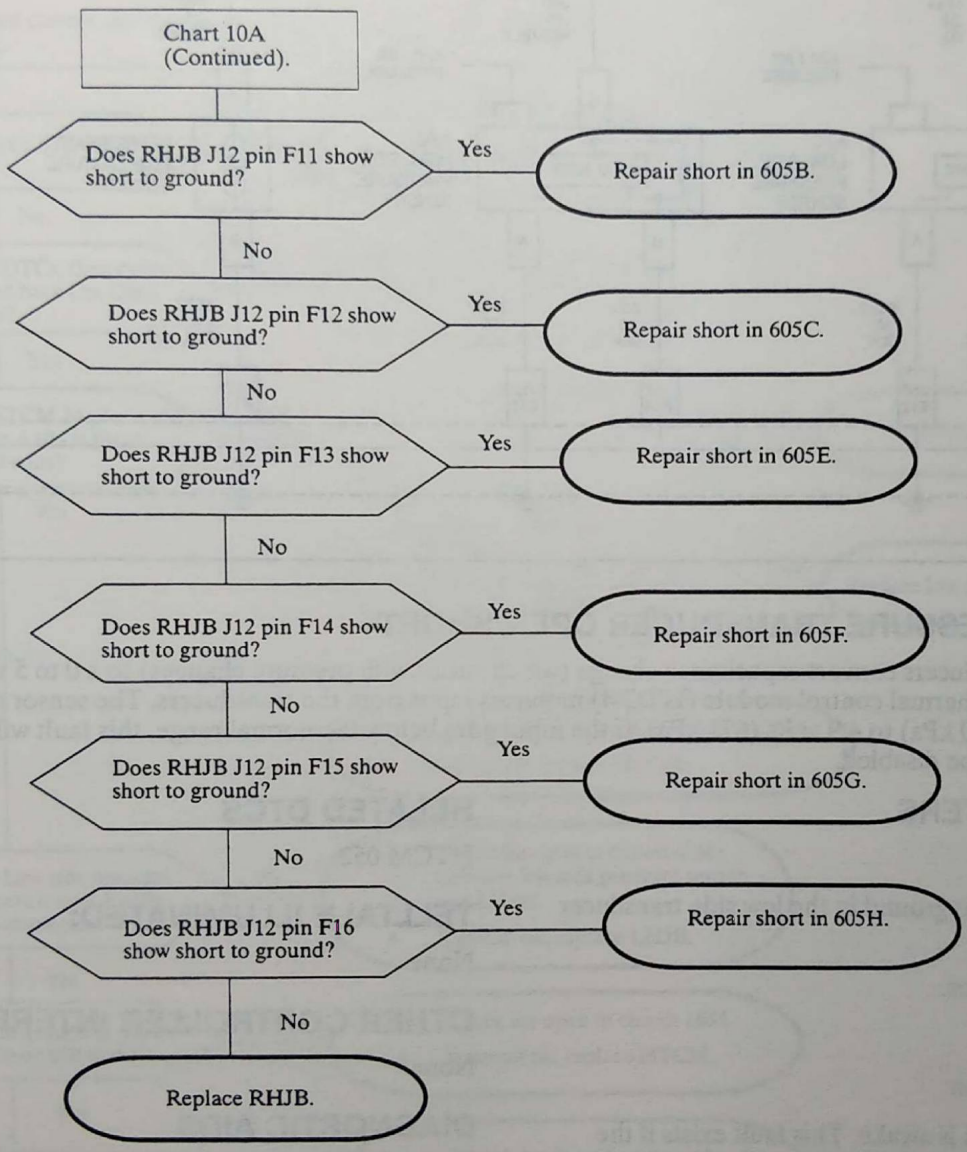
DTC 10A
HIGH SIDE PRESSURE TRANSDUCER OPEN/SHORT (CONTINUED)



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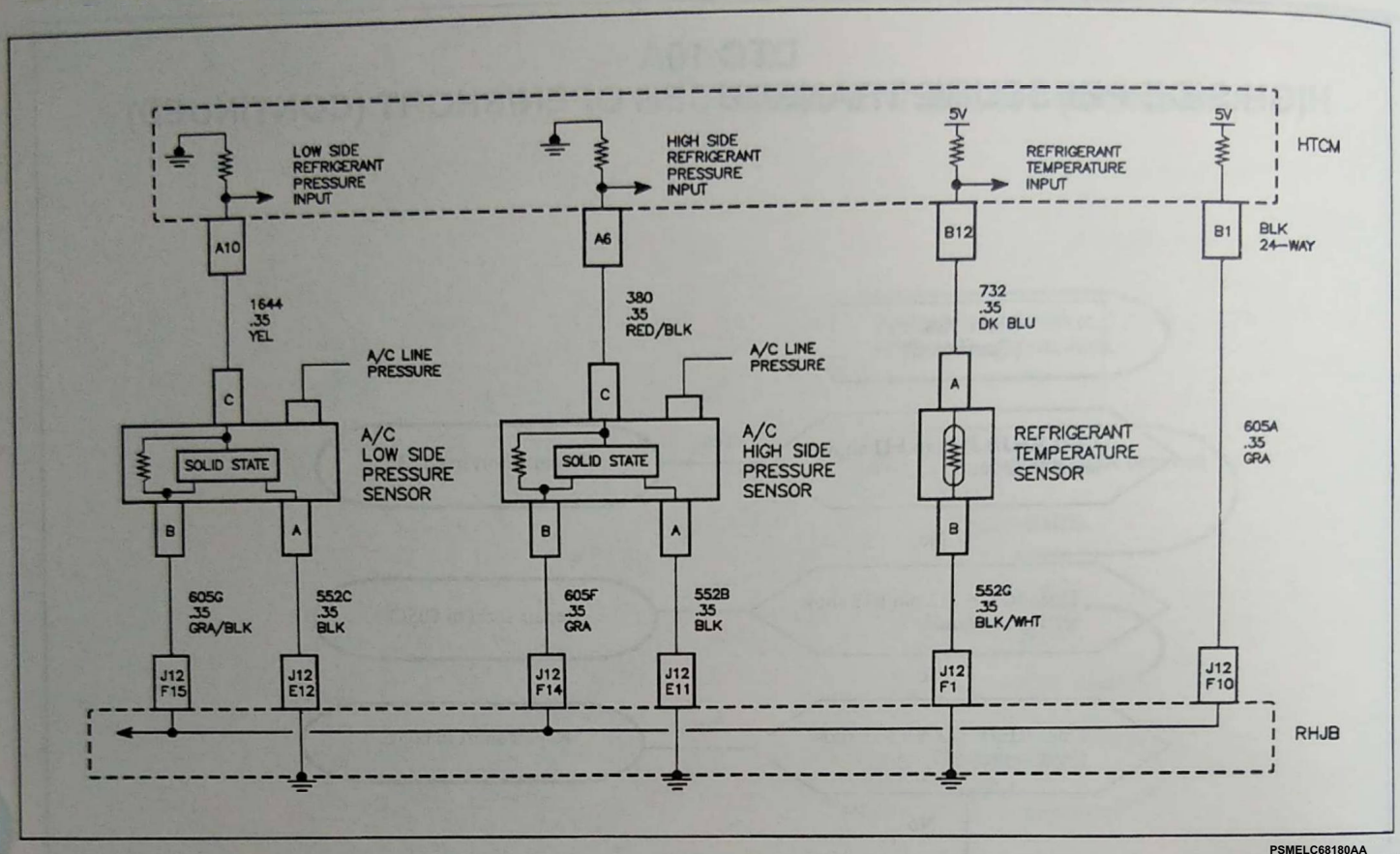
^DTC 11 ^LOW SIDE PRESSURE TRANSDUCER OPEN/SHORT



PSMELC68180AA

LOW SIDE PRESSURE TRANSDUCER OPEN/SHORT

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The HPVS/thermal control module (HTCM) monitors input from the transducers. The sensor operating range is 0.2 volts (30 kPa) to 4.9 volts (671 kPa). If the input goes below the normal range, this fault will be set and the heat pump will be disabled.

DTC PARAMETERS

DTC 11 will set if:

- Open or short to ground in the low side transducer circuit.
- Faulty transducer.
- HTCM failure.

DTC 11 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.10 volts on the Low Side transducer input circuit. The HTCM will not detect a short to voltage since normal operating pressures mav cause the transducer to indicate 5.0 volts.

FAILURE ACTION

Heat pump operation will be disabled.

RELATED DTCS

HTCM 052

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC11
LOW SIDE PRESSURE TRANSDUCER OPEN/SHORT

- Vehicle in Run mode.
- Connect Scan tool.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Read and record current and history HTCM DTCs.

Are HTCM DTCs 010,18, 22, 58. and 62 set?
- Yes → Go to chart 10A.
- No →

Clear HTCM DTCs, then cycle vehicle Off and back On. Does the DTC reset?
- No → Problem is intermittent. Refer to Diagnostic Aids.
- Yes →

Backprobe HTCM 24 pin connector pin A10 - is there less than 0.10 volts?
- No → Is there over 4.9 volts?
  - No → Replace HTCM.
  - Yes → Disconnect low side pressure X. sensor connector. Is there still over 4.9 volts at HTCM pin / A10?
    - No → (Replace low side pressure sensor.)
    - Yes →
      - Check for short to voltage on circuit 1644.
      - If circuit ok, replace HTCM.
- Yes →

Disconnect Low side pressure sensor. Is there over 4.8 volts on pin B of connector?
- No →
  - Check for open in circuit 605G between low side pressure sensor and LHJB.
  - If circuit ok, replace LHJB.
- Yes →

Is resistance to ground at pin C of connector over 60k ohms?
- Yes →
  - Check for open in circuit 1644.
  - If circuit ok, replace HTCM.
- No →

Is resistance to ground at pin C under 10k ohms?
- Yes →
  - Check for short to ground in circuit 1644.
  - If circuit ok, replace HTCM.
- No →

Is resistance to ground at pin A under 2.0 ohms?
- No →
  - Check for open in circuit 552C.
  - If circuit ok, replace RHJB.
- Yes →

Replace low side pressure senso^

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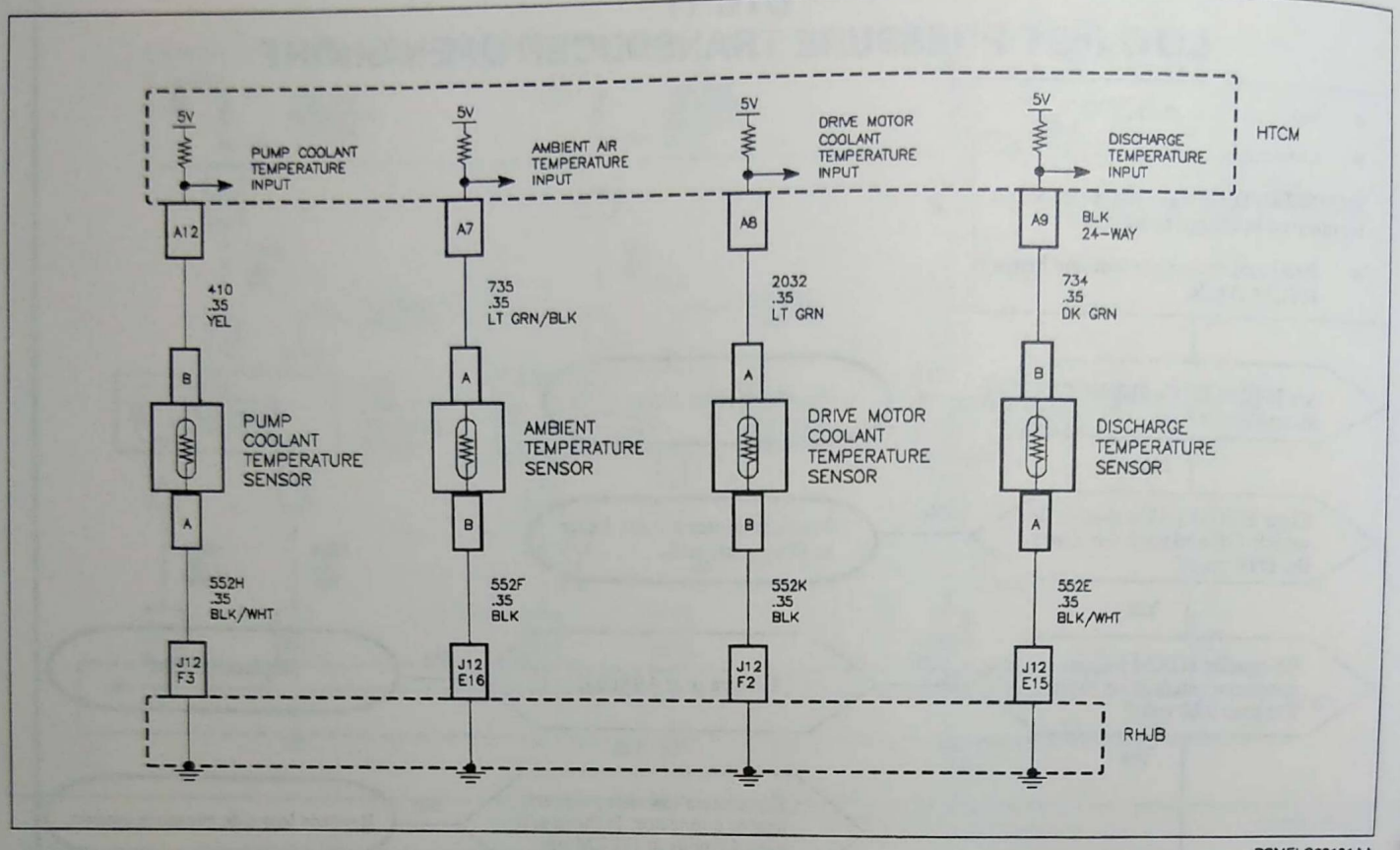
DTC 12 - DRIVE MOTOR COOLANT TEMPERATURE SENSOR (DMTS)

SHORT TO GROUND



PSMELC68181AA

DRIVE MOTOR COOLANT TEMPERATURE SENSOR (DMTS) SHORT TO GROUND

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC PARAMETERS

DTC 12 will set if:

- Short to ground in the DMTS circuit.
- Faulty sensor.
- HTCM failure.

DTC 12 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts. An open condition cannot be detected because of the overlap between normal operating voltage and the failure voltage.

FAILURE ACTION

The SERVICE SOON light will be turned On and the diagnostic for HTCM DTC 48 (drive unit overheat) is disabled.

RELATED DTCS

HTCM 48

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC 12
DRIVE MOTOR COOLANT TEMPERATURE SENSOR (DMTS) SHORT TO GROUND

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Does the DTC reset?

No → Problem is intermittent. Refer to Diagnostic Aids.) A

Yes

Backprobe HTCM 24 pin connector pin A8 - is there less than 0.06 volts in run? *s'*

No → Replace HTCM.

Yes

Disconnect drive motor coolant temperature sensor. Is there over 4.8 volts on pin A of connector?

No *f* Check for short to ground in (circuit 2032 between sensor) and HTCM.

Yes

Replace drive motor temperature sensor.

DRIVE UNIT COOLANT TEMPERATURE	
Temp C- (F-)	Resistance Ohms
-40 (-40)	73.6k – 127.8k
-20 (-4)	21.9k — 35.5k
0(32)	7.5k - 11.4k
10(50)	4.5k - 6.8k
20 (68)	3108 - 3922
30 (86)	1993 - 2482
35 (95)	1611 - 2482
40 (104)	1309 - 1610
45(113)	1069 - 1308
50(122)	877.9 — 1068
55 (131)	727.6 - 880
60(140)	605.9 - 728.9
65(149)	507 - 606.8
70(158)	426 - 507.5
80(176)	304.7 - 359.7
90(194)	221.4 - 259.2
100 (212)	163.3 - 189.6
140 (284)	53.95 - 65.69

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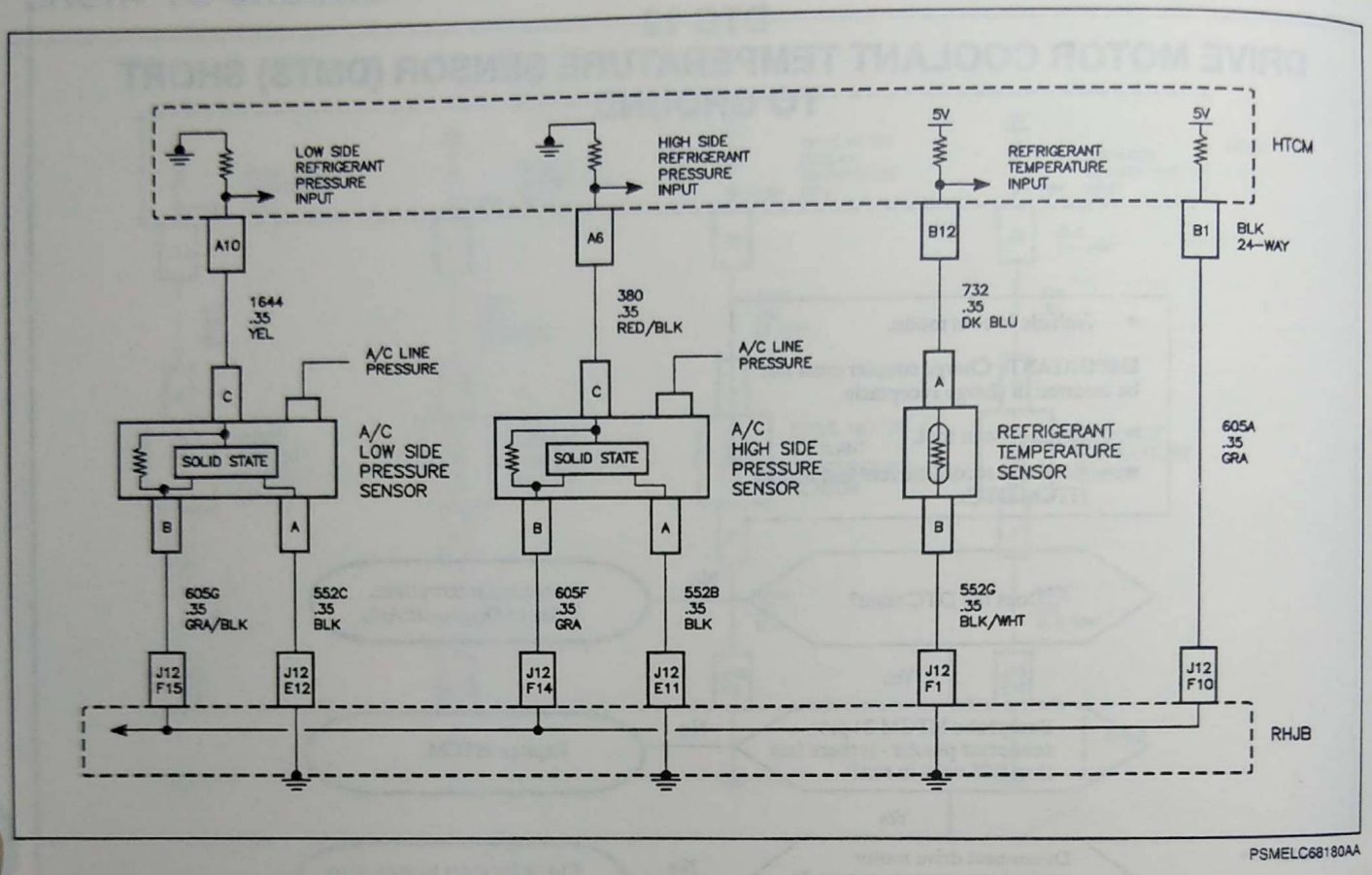
DTC 13 - REFRIGERANT TEMPERATURE SENSOR (R T S) SHORT TO GROUND



PSMELC68180AA

REFRIGERANT TEMPERATURE SENSOR (RTS) SHORT TO GROUND

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC PARAMETERS

DTC 13 will set if:

- Short to ground in the RTS circuit.
- Faulty sensor.
- HTCM failure.

DTC 13 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts. An open condition cannot be detected because of the overlap between normal operating voltage and open circuit voltage.

FAILURE ACTION

The SERVICE SOON light will be turned On.

RELATED DTCS

None

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value change or the DTC sets.

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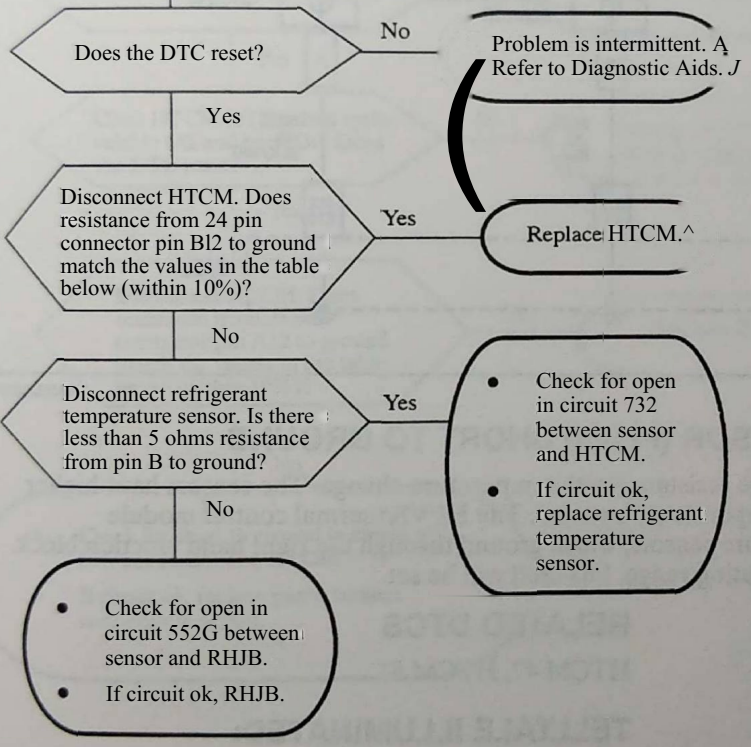
DTC 13
REFRIGERANT TEMPERATURE SENSOR (RTS) SHORT TO GROUND

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

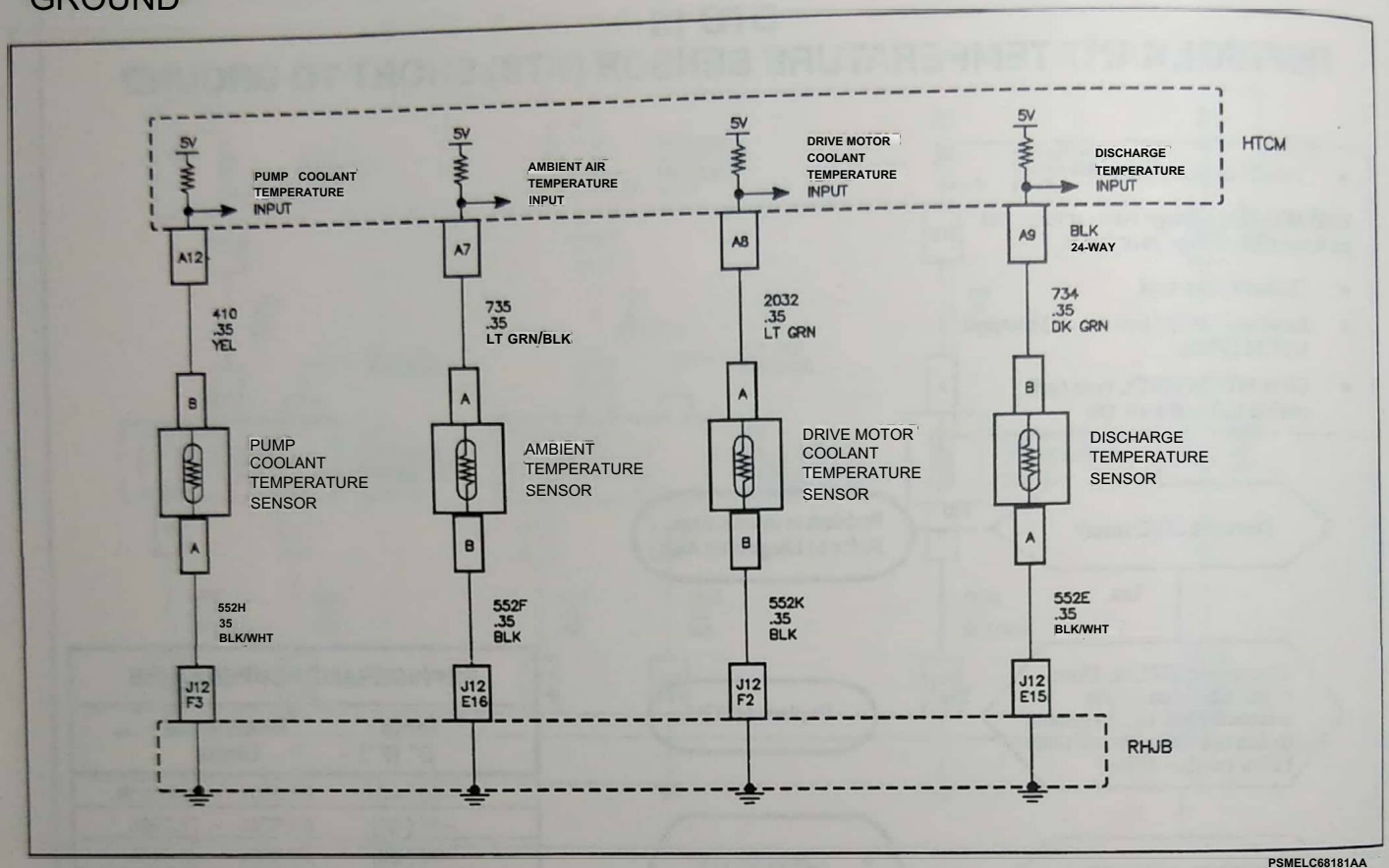
- Connect Scan tool.
- Read and record current and history HTCM DTCs.
- Clear HTCM DTCs. then cycle vehicle Off and back On.


Does the DTC reset?
No
Problem is intermittent. A Refer to Diagnostic Aids. J
Yes
Disconnect HTCM. Does resistance from 24 pin connector pin Bl2 to ground match the values in the table below (within 10%)?
Yes
Replace HTCM.^
No
Disconnect refrigerant temperature sensor. Is there less than 5 ohms resistance from pin B to ground?
Yes
Check for open in circuit 732 between sensor and HTCM.
If circuit ok, replace refrigerant temperature sensor.
No
Check for open in circuit 552G between sensor and RHJB.
If circuit ok, RHJB.

REFRIGERANT TEMPERATURE	
Temp C- (F-)	Resistance Ohms
-40 (-40)	88.950k - 108.610k
-35 (-31)	63.974k - 77.095k
-30 (-22)	46.659k - 55.511k
-25 (-13)	34.482k - 40.509k
-20 (-4)	25.801k - 29.936k
-15(5)	19.531k — 22.387k
-10(14)	14.948k - 16.930k
-5 (23)	11.560k - 12.939k
0(32)	9.028k — 9.988k
5(41).	6.988k – 7.646k
10(50)	5.456k — 5.907k
15 (59)	4.296k - 4.604k
20 (68)	3381 - 3618
25 (77)	2725 - 2865
30 (86)	2174 - 2306
35 (95)	1747 - 1868
40 (104)	1413 - 1524
45 (113)	1150 - 1250
50 (122)	942 - 1032
55 (131)	773 - 853
60 (140)	637 - 709
65 (149)	529 - 591
70 (158)	443 - 495
75 (167)	373 - 417
80 (176)	315 - 352
85 (185)	267 - 299
90(194)	227 - 255
95 (203)	194 - 218
100(212)	166 - 187

CamScanner

^CTTTPUMP COOLANT TEMPERATURE SENSOR (POTS) SHORT TO GROUND



PUMP COOLANT TEMPERATURE SENSOR (PCTS) SHORT TO GROUND

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC PARAMETERS

DTC 14 will set if:

- Short to ground in the PCTS circuit.
- Faulty sensor.
- HTCM failure.

DTC 14 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts An open condition cannot be detected because of the overlap between normal operating voltage and open circuit voltage.

FAILURE ACTION

The SERVICE SOON light will be turned On.

The front end fan and coolant pump will be commanded to high speed, the coolant recovery check value will be

be ZJ6d t0 thC radl3tOr P○Siti0n, and -gen will

RELATED DTCS

HTCM 47, HTCM 51.

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value change or the DTC sets.

CamScanner

DTC 14

PUMP COOLANT TEMPERATURE SENSOR (PCTS) SHORT TO GROUND

• Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Are other HTCM DTCs set?

Yes → Diagnose other DTCs first^^

No

Clear HTCM DTCs, then cycle vehicle Off and back On. Does the DTC reset?

No → Problem is intermittent. Refer to Diagnostic Aids.

Yes

Disconnect HTCM. Does resistance from 24 pin connector pin A12 to ground match the values in the table below (within 10%)?

Yes → Replace HTCM.

No

- Check for short to ground in circuit 410 between sensor and HTCM.
- If circuit ok, replace pump coolant temperature sensor.

PUMP COOLANT TEMPERATURE	
Temp C(F-)	Resistance Ohms
-40 (-40)	73.566k - 127.848k
-20 (-4)	21.900k - 35.455k
0(32)	7.448k - 11.398k
10(50)	4.556k - 6.788k
20 (68)	3108 – 3922
30 (86)	1993 – 2482
35 (95)	1611 – 1993
40(104)	1309 - 1610
45 (113)	1069 – 1308
50(122)	877.9 – 1068
55 (131)	727.6 – 880
60(140)	605.9 - 728.9
65(149)	507 - 606.8
70 (158)	426 - 507.5
80 (176)	304.7 - 359.7
90 (194)	221.4 - 259.2
100 (212)	163.3 – 189.6
140 (284)	53.95 - 65.69

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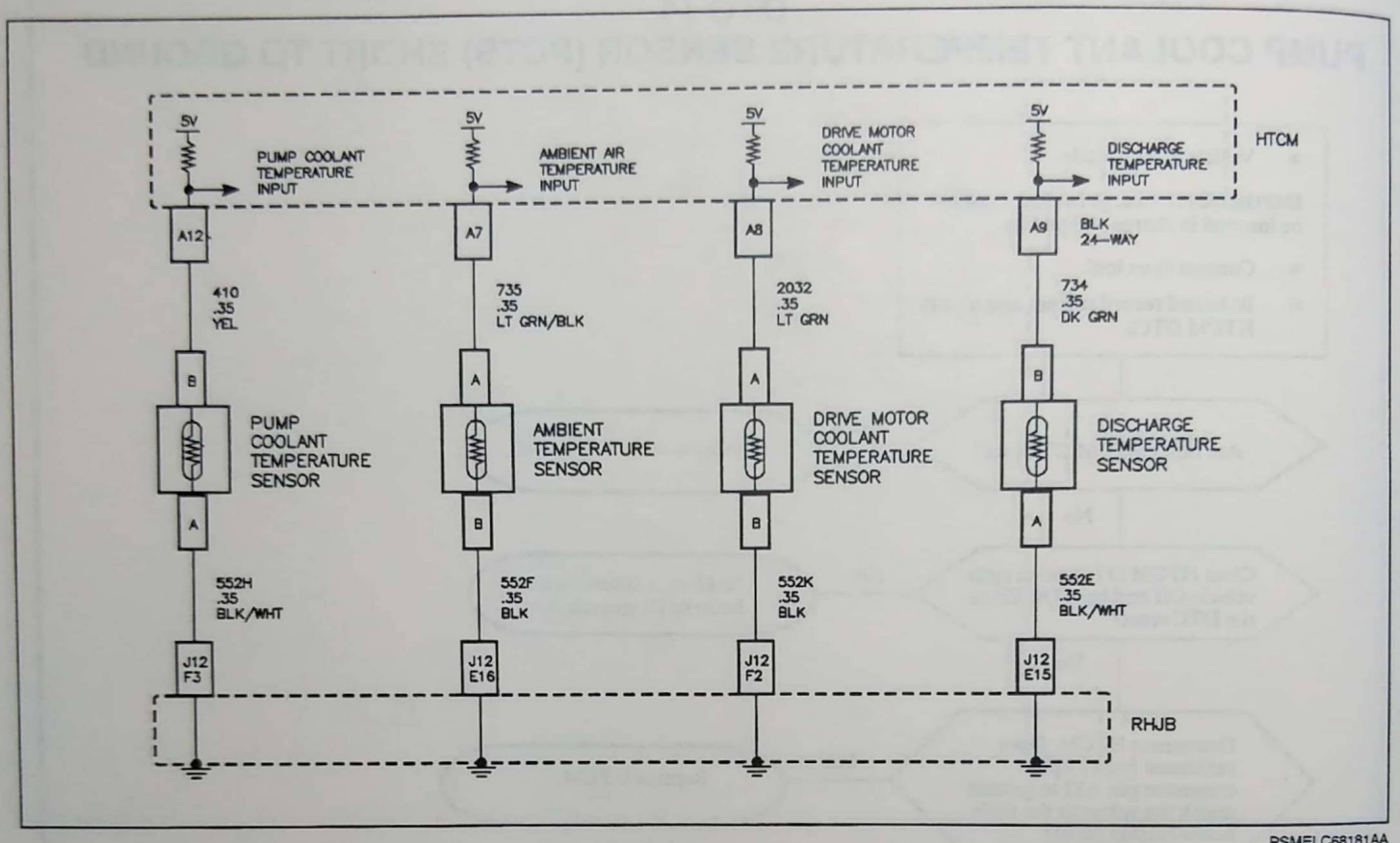
DTC 15 - DISCHARGE TEMPERATURE SENSOR (DTS)
SHORT TO GROUND



PSMELC68181AA

DISCHARGE TEMPERATURE SENSOR (DTS) SHORT TO GROUND

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC PARAMETERS

DTC 15 will set if:

- Short to ground in the DTS circuit.
- Faulty sensor.
- HTCM failure.

DTC 15 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts. An open condition cannot be detected because of the overlap between normal operating voltage and open circuit voltage.

FAILURE ACTION

The SERVICE SOON light will be turned On.

RELATED DTCS

None.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 15
DISCHARGE TEMPERATURE SENSOR (DTS) SHORT TO GROUND

• Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan Tool.
- Read and record cunent and history HTCM DTCs.
- Clear HTCM DTCs, then cycle vehicle Off and back On.

Does the DTC reset?

No → Problem is intermittent. A Refer to Diagnostic Aids.)

Yes

Disconnect HTCM. Does resistance from 24 pin connector pin A9 to ground match the values in the table below (within 10%)?

Yes → Replace HTCM.

No

Is the resistance less than those given in the table?

Yes →
- Check for short to ground in circuit 734 between sensor and HTCM.
- If circuit ok, replace discharge temperature sensor.

No

Disconnect discharge temperature sensor. Is there less than 5 ohms resistance from pin B to ground?

Yes →
- Check for open in circuit 734 between sensor and HTCM.
- If circuit ok, replace discharge temperature sensor.

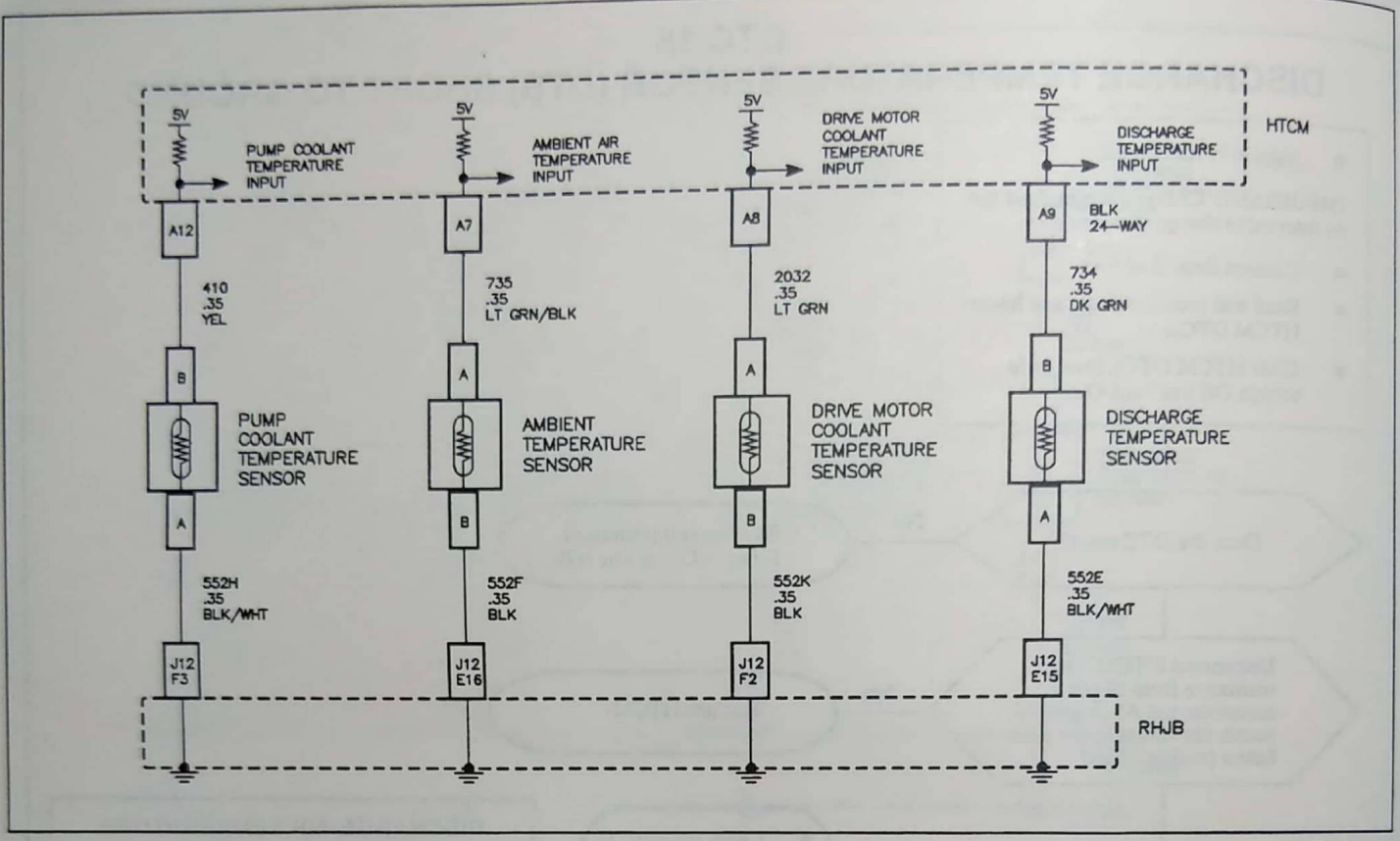
No

- Check for open in circuit 552E between sensor and RHJB.
- If circuit ok, RHJB.

DISCHARGE AIR TEMPERATURE	
Temp C° (F-)	Resistance Ohms
-40 (-40)	94.004k -107.3970k
-35 (-31)	6.7891k - 77.006k
-30 (-22)	49.547k - 55.794k
-25 (-13)	36.517k - 40.826k
-20 (-4)	27.164k - 30.157k
-15(5)	20.384k - 22.476k
-10(14)	15.428k - 16.890k
-5 (23)	11.765k - 12.800k
0(32)	9.039k - 9.775k
5(41)	7.009k - 7.536k
10(50)	5.477k - 5.856k
15(59)	4.310k - 4.583k
20 (68)	3416 – 3612
25 (77)	2725 – 2865
30 (86)	2175 – 2299
35(95)	1746 – 1857
40 (104)	1410 – 1508
45 (113)	1145 – 1231
50 (122)	935 – 1010
55(131)	770 – 836
60 (140)	638 – 696
65 (149)	531 – 582
70 (158)	444 – 489
75 (167)	373 – 412
80 (176)	315 – 349
85 (185)	267 – 297

CamScanner

DTC 16 – OUTSIDE TEMPERATURE SENSOR (OTS) SHORT TO GROUND



PSMELC68181AA

OUTSIDE TEMPERATURE SENSOR (OTS) SHORT TO GROUND

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC PARAMETERS

DTC 16 will set if:

- Short to ground in the OTS circuit.
- Faulty sensor.
- HTCM failure.

DTC 16 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts. An open condition cannot be detected because of the overlap between normal operating voltage and open circuit voltage.

FAILURE ACTION

The SERVICE SOON light will be turned On.
Compressor will operate in either heat or cool mode regardless of ambient temperature.

RELATED DTCS

HTCM 52.

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

When attempting to diagnose an intermittent problem, use the Scan tool* and review malfunction history diagnostic information. This data can be used to determine the conditions that were present when the DTC set.

* Select Malf History from the Scan tool HTCM menu.

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC16
OUTSIDE TEMPERATURE SENSOR (OTS) SHORT TO GROUND

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.
- Clear HTCM DTCs, then cycle vehicle Off and back On.

Does the DTC reset?

No → Problem is intermittent. Refer to Diagnostic Aids.

Yes

Disconnect HTCM. Does resistance from 24 pin connector pin A7 to ground match the values in the table below (within 10%)?

Yes → Replace HTCM.

No

Is the resistance less than those given in the table?

Yes →
- Check for short to ground in circuit 735 between sensor and HTCM.
- If circuit ok, replace outside temperature sensor.

No

Disconnect outside temperature sensor. Is there less than 5 ohms resistance from pin B to ground?

Yes →
- Check for open in circuit 735 between sensor and HTCM.
- If circuit ok, replace outside temperature sensor.

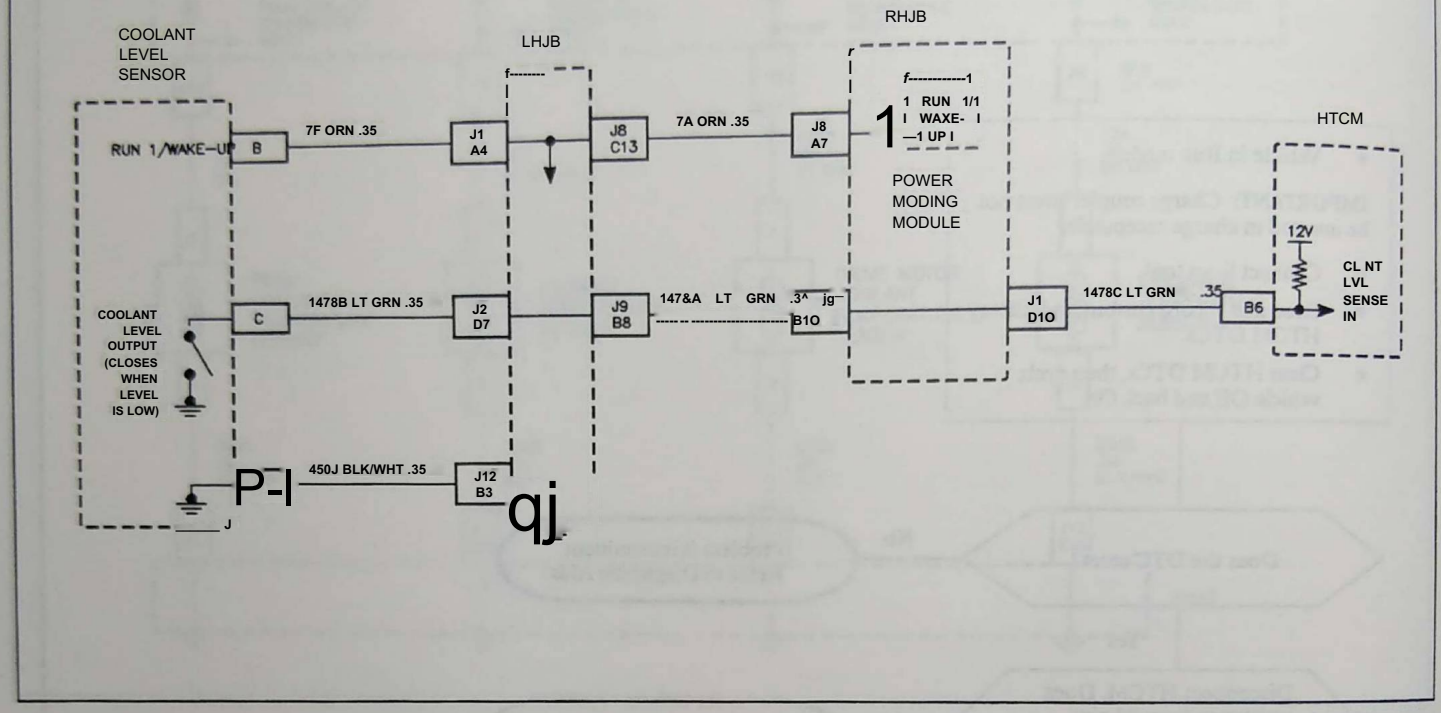
No

- Check for open in circuit 552F between sensor and RHJB.
- If circuit ok, RHJB.

OUTSIDE AIR TEMPERATURE	
°C (°F)	Resistance Ohms
-40 (-40)	31.1668k - 38.2120k
-35 (-31)	22.6390k -27.4035k
-30 (-22)	16.6115k -19.8505k
-25 (-13)	12.3056k -14.5166k
-20 (-4)	9.1987k -10.7120k
-15(5)	6.9354k - 7.9724k
-10(14)	5.2716k - 5.9819k
-5 (23)	4.0381k - 4.5231k
0 (32)	31160 - 34454
5(41)	24329 - 26630
10(50)	19147 - 20747
15(59)	15183 - 16286
20 (68)	12125 - 12876
25 (77)	9750 - 10250
30 (86)	7812 - 8289
35 (95)	6303 – 6749
40(104)	5119 - 5530
45 (113)	4184 - 4559
50(122)	3440 - 3780
55 (131)	2845 - 3152
60(140)	2366 - 2642

CamScanner

DT^T^OOLANT LEVEL SWITCH (CLS) FAILURE



PSMELC68182AA

COOLANT LEVEL SWITCH (CLS) FAILURE

The coolant level switch (CLS) is a “smart” switch. The switch determines if coolant is present by pulsing a light emitting diode into the coolant, and monitoring its reflection with a phototransistor. The CLS contains filtering to prevent false detection of low coolant. On power up, the CLS drives its output low, then high. If the HPVS/thermal control module (HTCM) does not detect this initialization test, this fault will be set. If the CLS input circuit fails after startup, an HTCM DTC 54 will be set.

DTC PARAMETERS

DTC 17 will set if:

- CLS input circuit open or shorted to voltage or ground.
- CLS Run one circuit open or shorted to ground.
- CLS ground circuit open.
- Faulty coolant level switch.

• HTCM failure.

DTC 17 will set when:

When the vehicle is powered up. The CLS performs a powerup initialization test, pulling the circuit low, then high. If the HTCM does not detect this, the test fails and this fault will be logged.

FAILURE ACTION

The SERVICE SOON light will be turned On for the duration of the power cycle and the diagnostic for HTCM DTC 54 (low coolant level) is disabled.

RELATED DTCS

HTCM 50, 54.

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

- This DTC may set falsely if auxiliary battery voltage is low.
- Check the tightness of the female terminal grip with a spare male terminal.
- If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 17
COOLANT LEVEL SWITCH (CLS) FAILURE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.
- Clear HTCM DTCs, then cycle vehicle Off and back On.

Does the DTC reset?

No → Problem is intermittent. Refer to Diagnostic Aids.

Yes

- Backprobe HTCM pin B8.
- Power up vehicle. Voltage should be pulled low for three to five seconds, then jump to battery volts.
- What did circuit do?

Operated Correctly → Replace HTCM.

Line Stays At Zero Volts

Line Stays At Battery Volts

Disconnect LHJB J2 connector. Is circuit at battery voltage now?

Yes →
- Check circuit 1478B for short to ground.
- If circuit ok, replace coolant level switch.

No

Disconnect RHJB J8 connector. Is circuit at battery voltage now?

Yes →
- Check circuit 1478A for short to ground.
- If circuit ok, replace LHJB.

No

Disconnect HTCM. Is pin B6 showing short to ground?

Yes →
- Check circuit 1478C for short to ground.
- If circuit ok, replace RHJB.

No

Replace HTCM.

Backprobe RHJB J8 pin B10 - is battery voltage present?

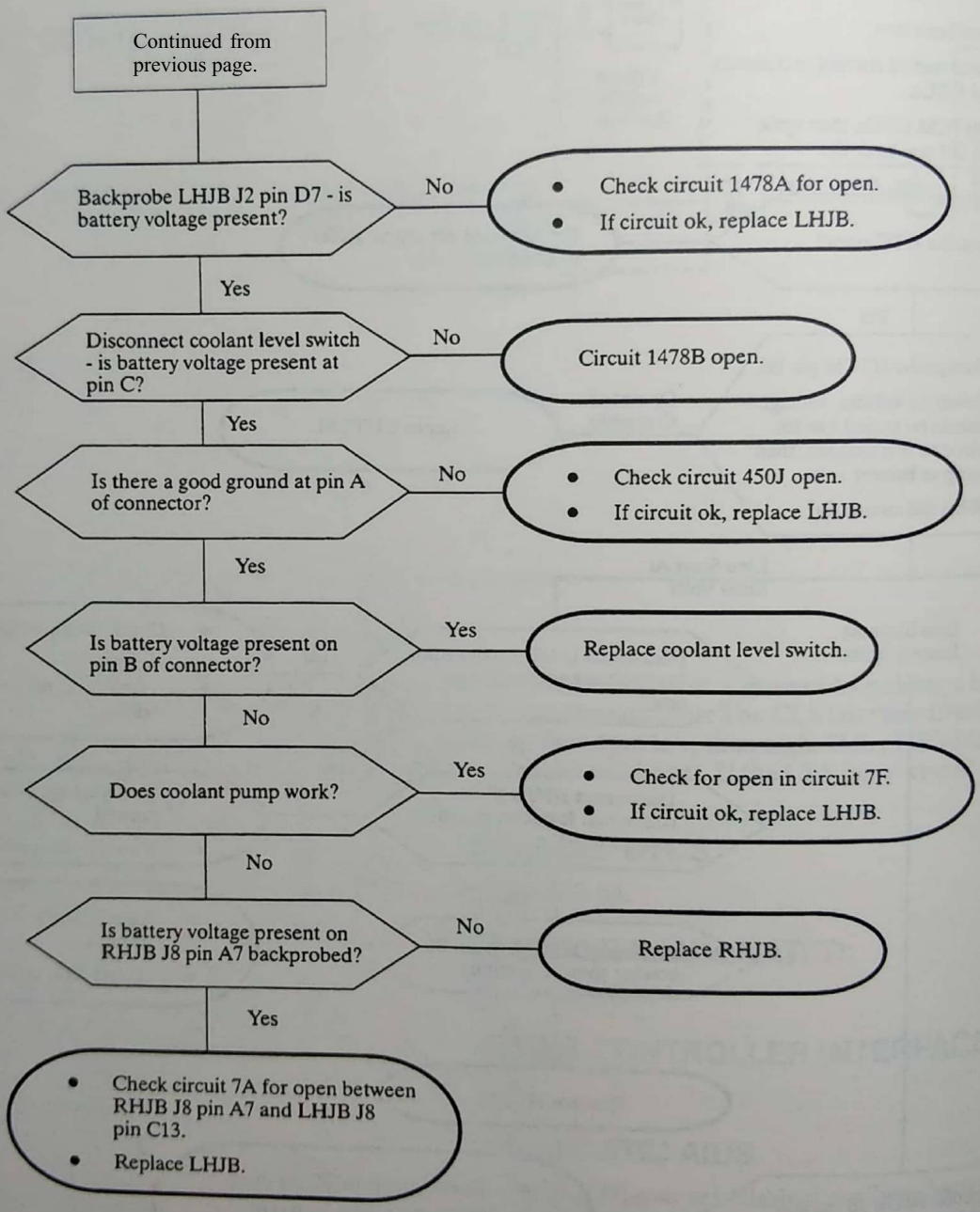
No →
- Check circuit 1478C for open.
- If circuit ok, replace RHJB.

Yes

Go to next page.

CamScanner

DTC 17
COOLANT LEVEL SWITCH (CLS) FAILURE (CONTINUED)


Continued from previous page.
Backprobe LHJB J2 pin D7 - is battery voltage present?
No
Check circuit 1478A for open.
If circuit ok, replace LHJB.
Yes
Disconnect coolant level switch - is battery voltage present at pin C?
No
Circuit 1478B open.
Yes
Is there a good ground at pin A of connector?
No
Check circuit 450J open.
If circuit ok, replace LHJB.
Yes
Is battery voltage present on pin B of connector?
Yes
Replace coolant level switch.
No
Does coolant pump work?
Yes
Check for open in circuit 7F.
If circuit ok, replace LHJB.
No
Is battery voltage present on RHJB J8 pin A7 backprobed?
No
Replace RHJB.
Yes
Check circuit 7A for open between RHJB J8 pin A7 and LHJB J8 pin C13.
Replace LHJB.

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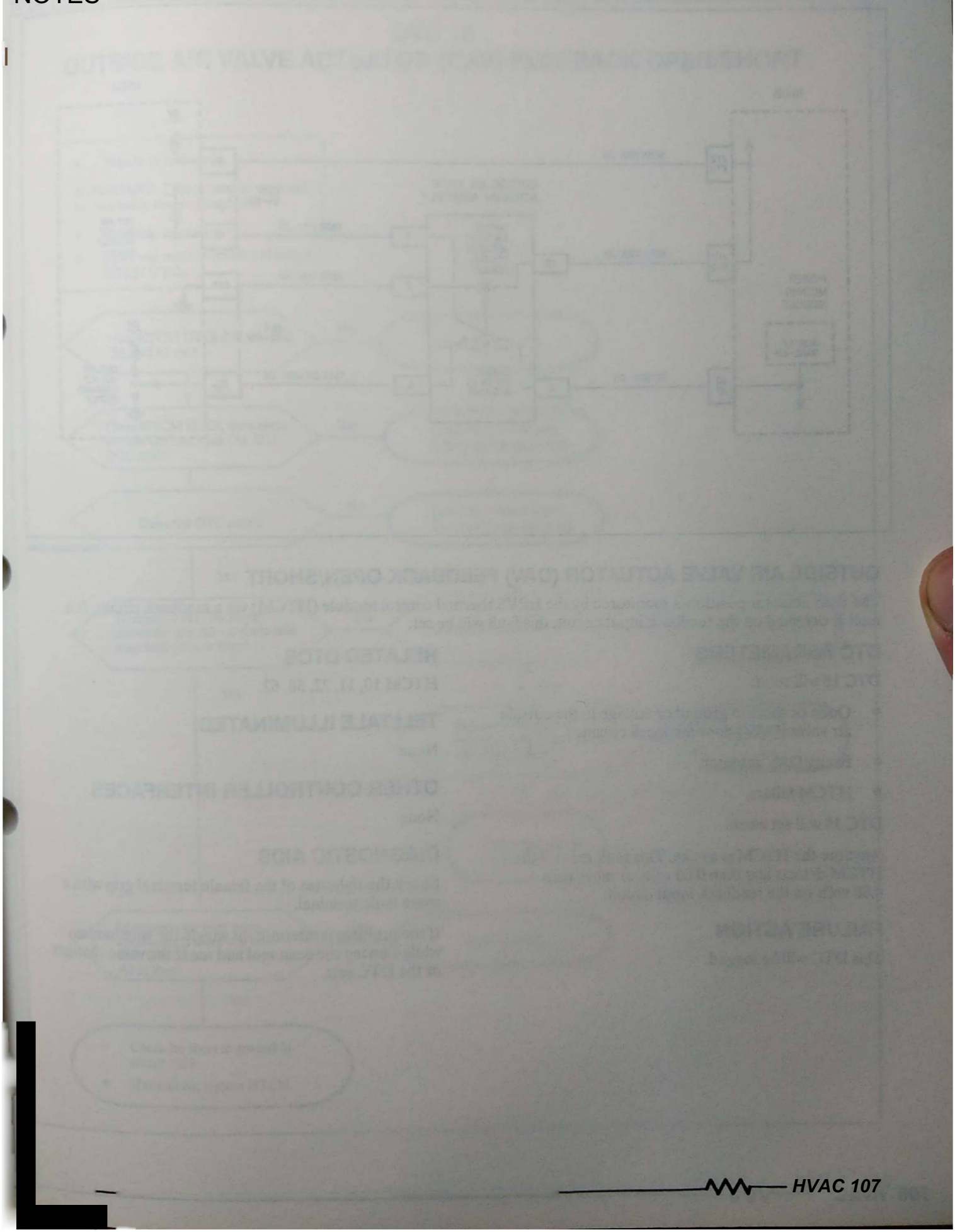
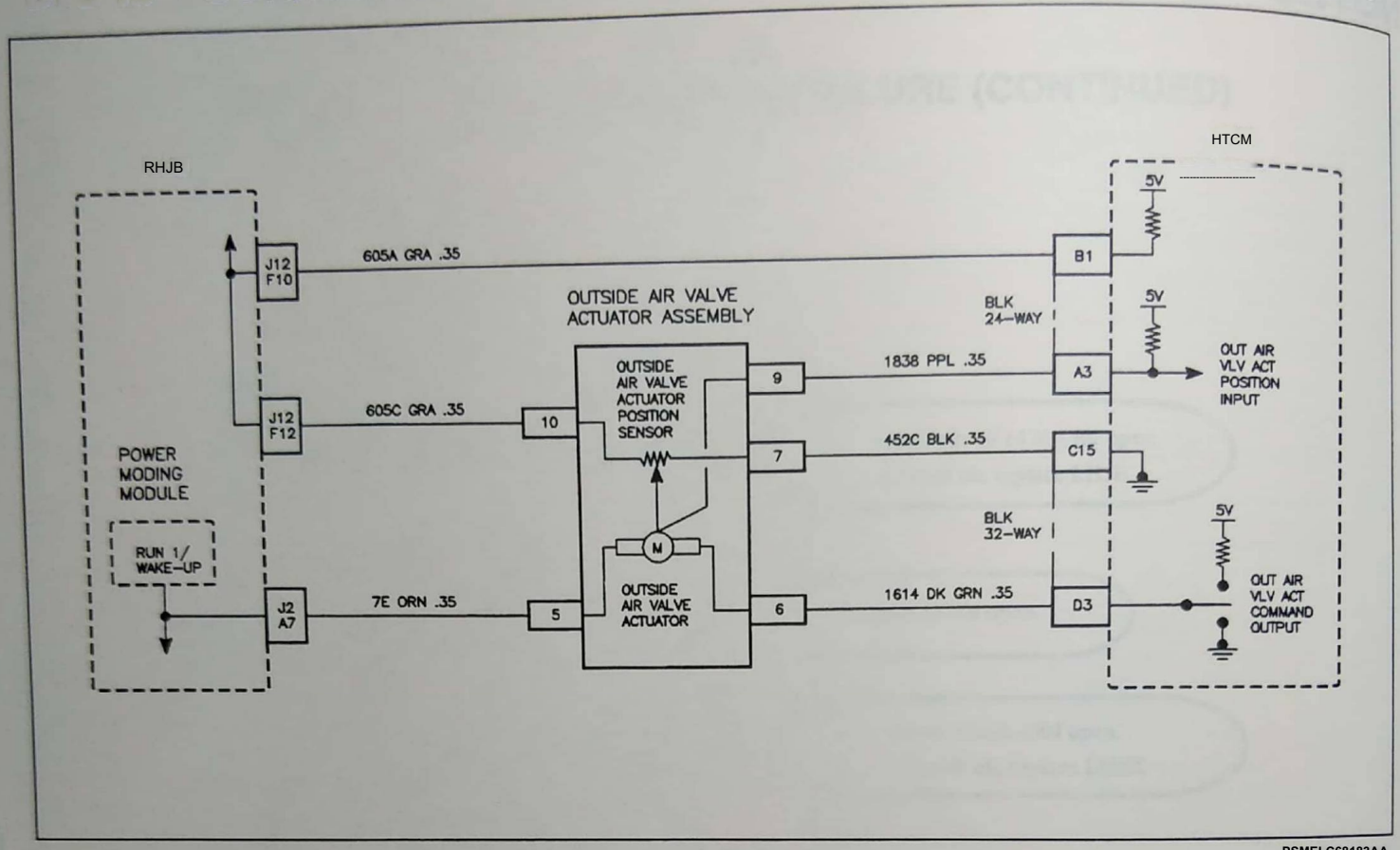
NOTES



CamScanner

^TTOUTSIDE AIR VALVE ACTUATOR (OAV) FEEDBACK OPEN/SHORT



PSMELC68183AA

OUTSIDE AIR VALVE ACTUATOR (OAV) FEEDBACK OPEN/SHORT

The door actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If a fault is detected on the feedback input circuit, this fault will be set.

DTC PARAMETERS

DTC 18 will set if:

- Open or short to ground or voltage in the outside air valve (OAV) door feedback circuit.
- Faulty OAV actuator.
- HTCM failure.

DTC 18 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts or more than 4.88 volts on the feedback input circuit.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

HTCM 10,11,22, 58, 62.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC 18
OUTSIDE AIR VALVE ACTUATOR (OAV) FEEDBACK OPEN/SHORT

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Are HTCM DTCs 010, 011, 22, 58, and 62 set?
- Yes → Refer to chart 10A.
- No →

Clear HTCM DTCs, then cycle vehicle Off and back On. Did DTC reset?
- Yes → Condition intermittent. Refer to Diagnostic Aids.
- No →

Does the DTC reset?
- No → Problem is intermittent. Refer to Diagnostic Aids.
- Yes →

Backprobe HTCM 24 pin connector pin A3 - is there less than 0.06 volts in Run?
- No → Is there over 4.88 volts in Run?
  - No → Replace HTCM.
  - Yes → Backprobe air inlet door connector pin 9. Is there over 4.88 volts in Run?
    - Yes → Replace OAV.
    - No → Check for open in circuit 1838.
- Yes →

Disconnect air inlet door connector. Is there still less than 0.06 volts at HTCM pin A3 in Run?
- No → Replace OAV.
- Yes →

- Check for short to ground in circuit 1838.
- If circuit ok, replace HTCM.

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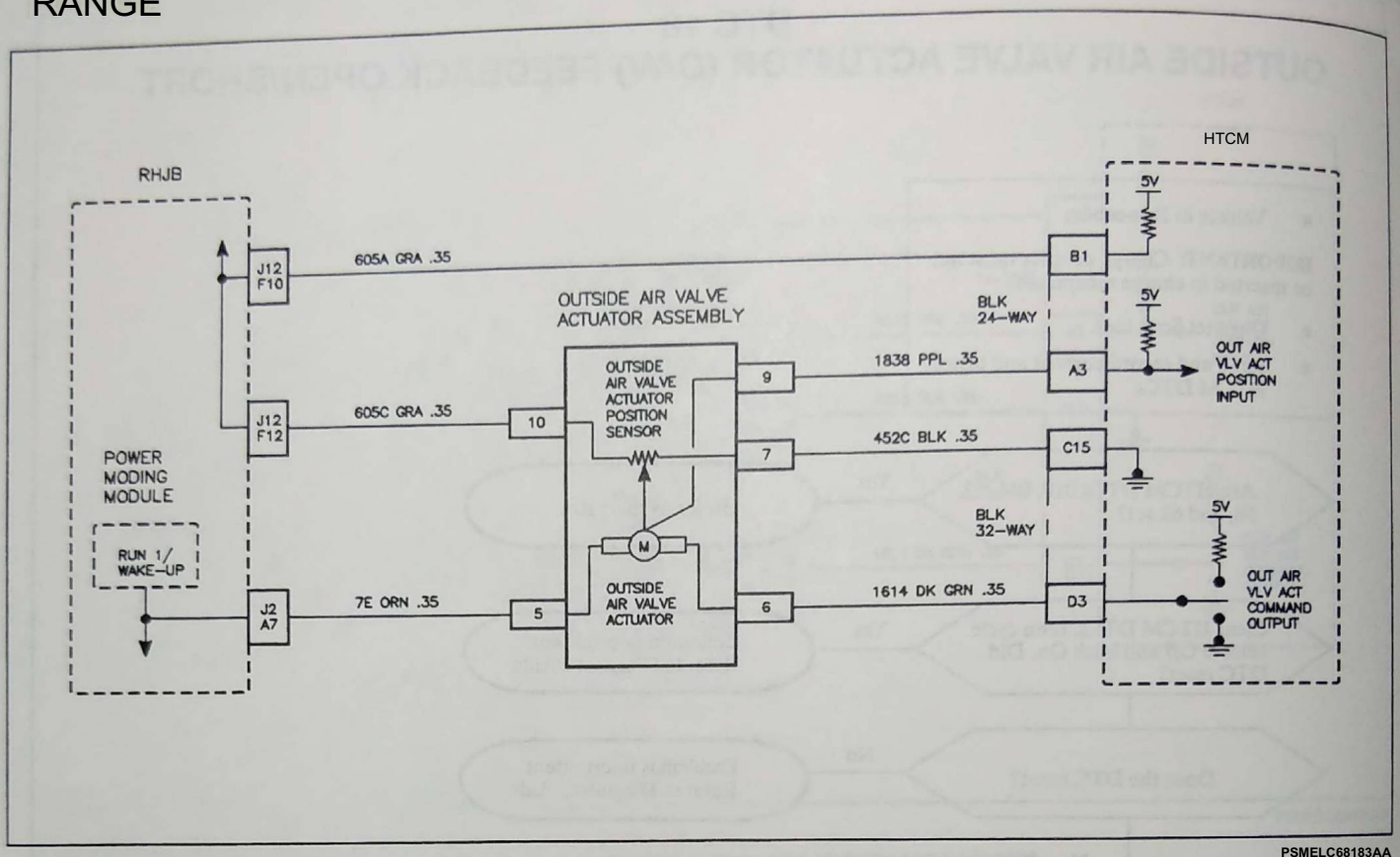
DTC 19 - OUTSIDE AIR VALVE ACTUATOR (OAV) FEEDBACK OUT OF RANGE



PSMELC68183AA

OUTSIDE AIR VALVE ACTUATOR (OAV) FEEDBACK OUT OF RANGE

The door actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. On power up after a loss of 12 volt power to the HTCM, the actuators are initialized by commanding travel to both positions. If the feedback indicates actuator travel out of range, this fault will be set.

DTC PARAMETERS

DTC 19 will set if:

- Mechanical binding.
- Faulty outside air valve actuator (OAV).

DTC 19 will set when:

The first time the HTCM is awake, after losing 12 volt power. On this first power up, the HTCM will command the Al door first to outside air, then to recirculate, while monitoring position feedback. This fault exists if the HTCM detects less than 0.20 volts or more than 4.88 volts change between the two positions.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

HTCM 20

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

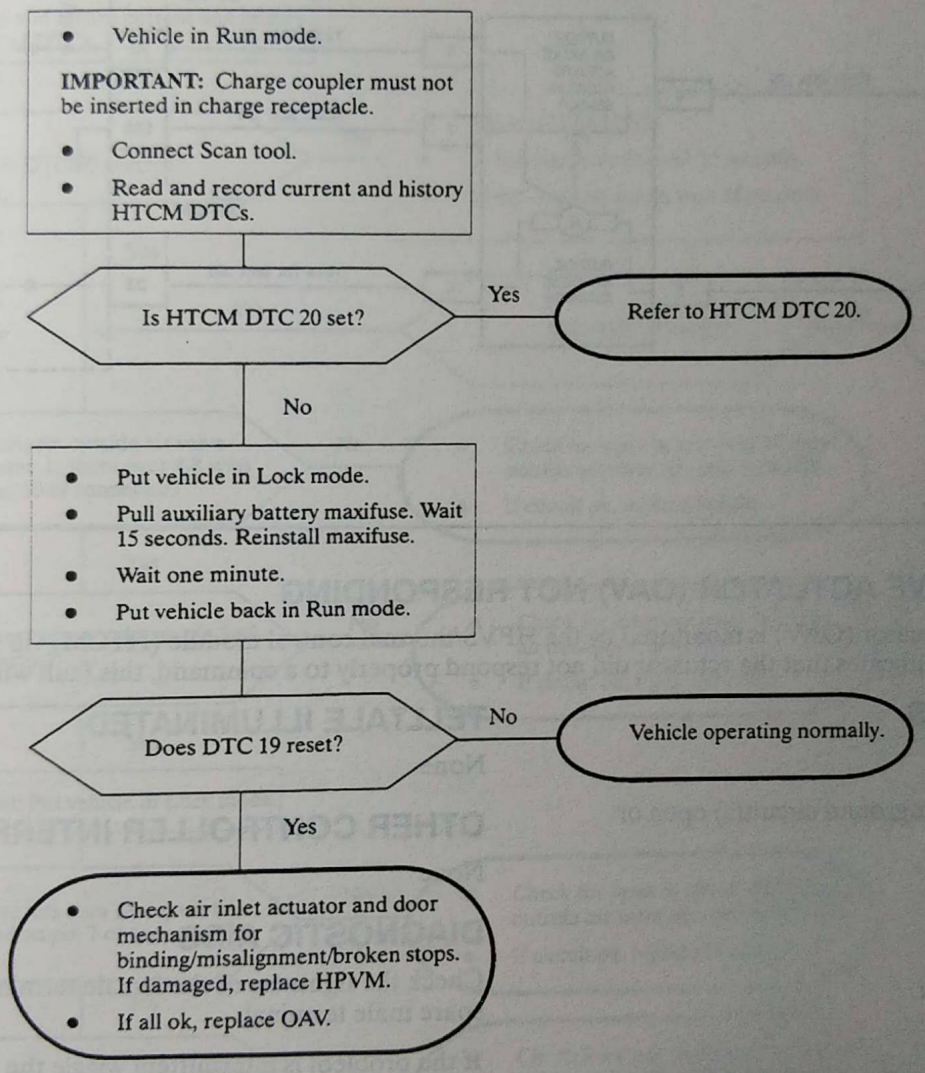
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 19

DTC19
OUTSIDE AIR VALVE ACTUATOR (OAV) FEEDBACK OUT OF RANGE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Is HTCM DTC 20 set?
Yes
Refer to HTCM DTC 20.
No
• Put vehicle in Lock mode.
• Pull auxiliary battery maxifuse. Wait 15 seconds. Reinstall maxifuse.
• Wait one minute.
• Put vehicle back in Run mode.
Does DTC 19 reset?
No
Vehicle operating normally.
Yes
• Check air inlet actuator and door mechanism for binding/misalignment/broken stops. If damaged, replace HPVM.
• If all ok, replace OAV.

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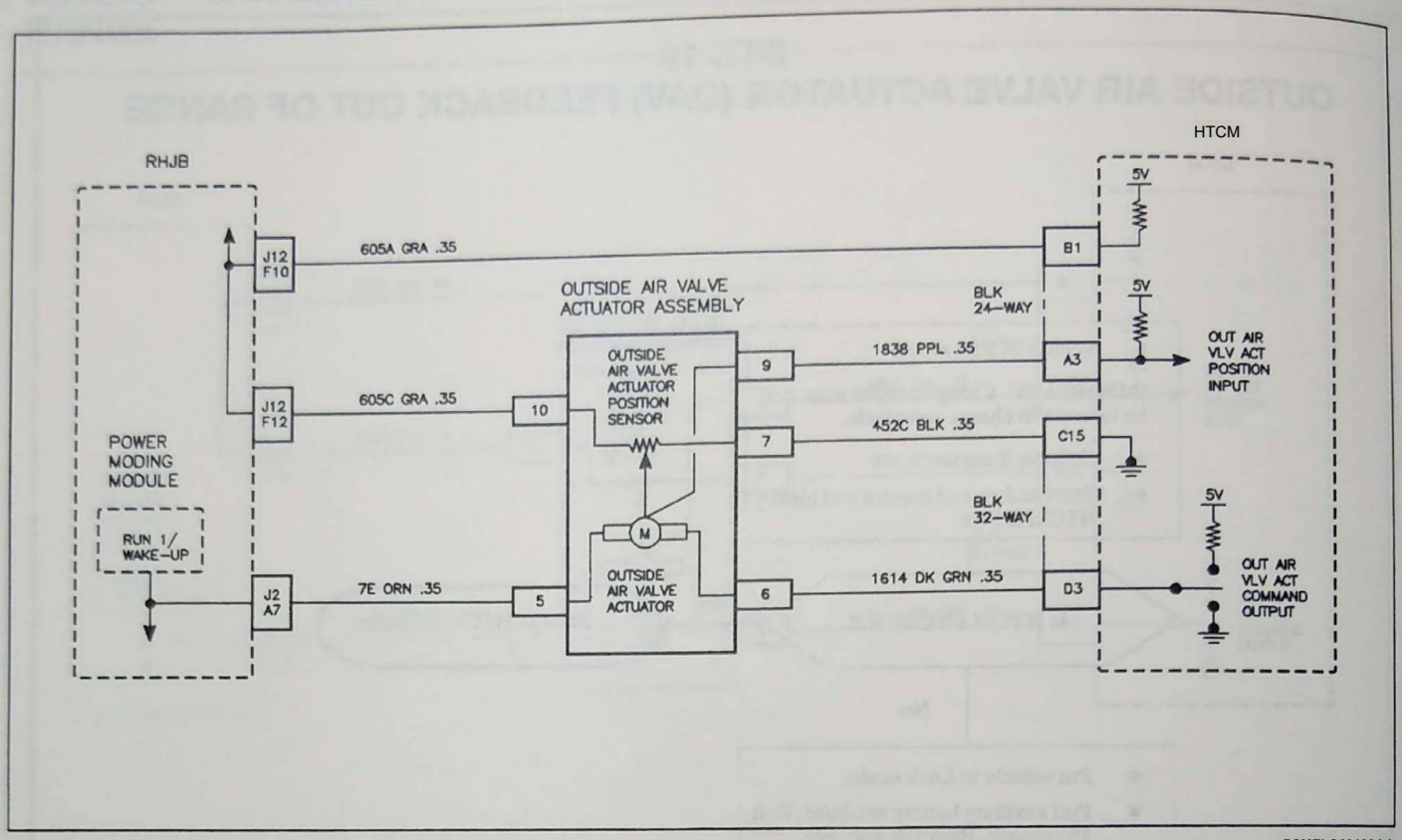
DTC 20 - OUTSIDE AIR VALVE ACTUATOR *(OAV)* NOT RESPONDING



PSMELC68183AA

OUTSIDE AIR VALVE ACTUATOR (OAV) NOT RESPONDING

The outside air valve actuator (OAV) is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If the feedback indicates that the actuator did not respond properly to a command, this fault will be set.

DTC PARAMETERS

DTC 20 will set if:

- OAV actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- HTCM failure.
- Faulty OAV actuator.

DTC 20 will set when:

Anytime the OAV feedback indicates that the OAV door did not reach the commanded position.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

HTCM 18,19.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC 20
OUTSIDE AIR VALVE ACTUATOR (OAV) NOT RESPONDING

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Is DTC 20 current?

No
- Clear HTCM DTCs.
- Select recirc mode, wait 15 seconds.
- Select fresh air mode, wait 15 seconds.

Yes

Did DTC 20 reset?

Yes

No
Problem is intermittent. Refer to Diagnostic Aids.

Disconnect outside air valve actuator. Is there over 4.8 volts on pin 10 of connector?

No
- Check for open in circuit 605C from outside air valve actuator to RHJB.
- If circuit ok, replace RHJB.

Yes

Is there battery volts on pin 5 of connector?

No
- Check for open in circuit 7E from air inlet door to RHJB.
- If circuit ok, replace RHJB.

Yes

Important: Put vehicle in Lock mode.

Is there less than five ohms to ground on pin 7 of connector?

No
- Check for open in circuit 452C from outside air valve actuator to HTCM.
- If circuit ok, replace HTCM.

Yes

Is pin 6 showing less than 3000 ohms to ground?

Yes
- Check for short to ground in circuit 1614 from outside air valve actuator to HTCM.
- If circuit ok, replace HTCM.

No

Is pin 6 showing over 7000 ohms to ground?

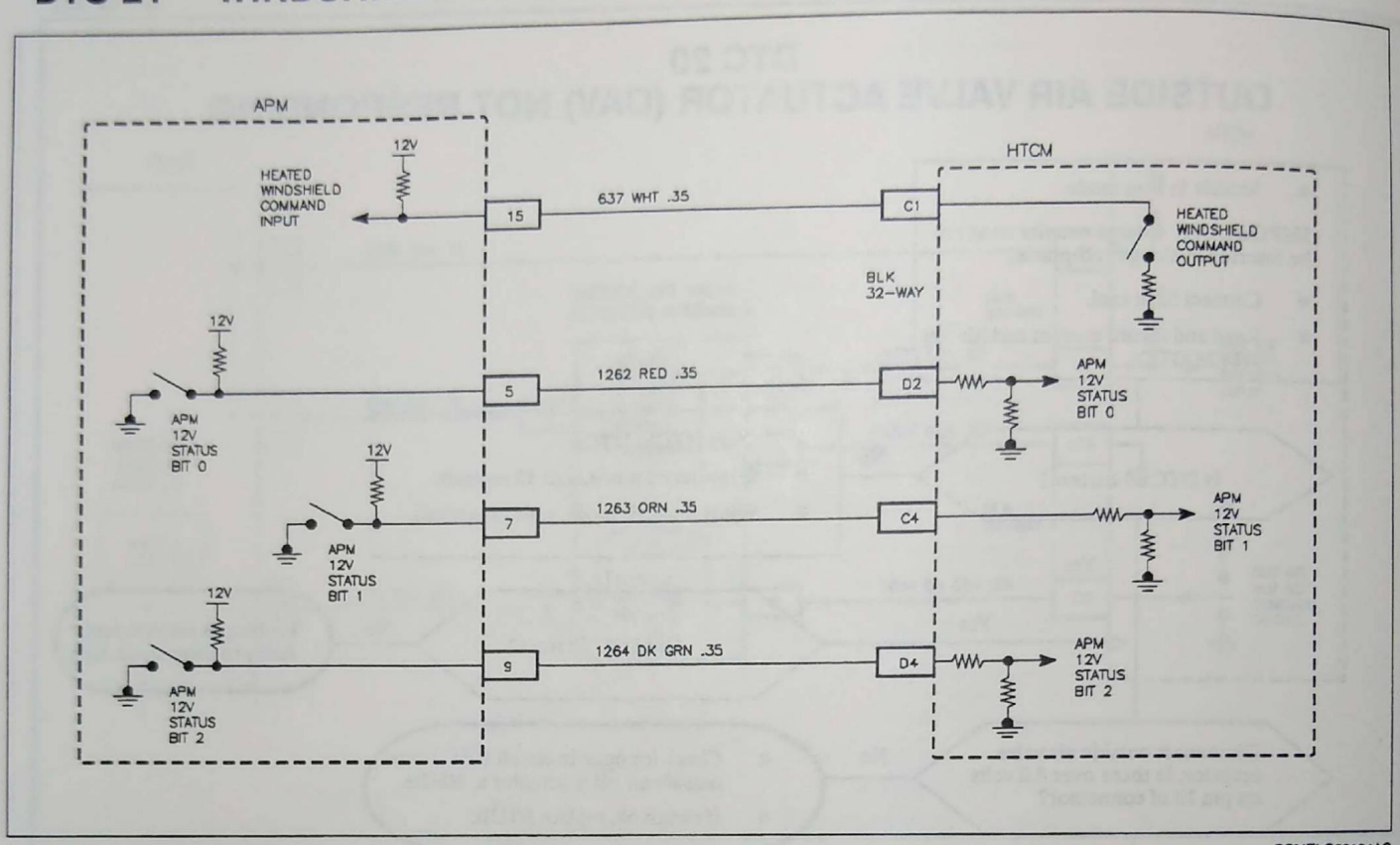
Yes
- Check for open in circuit 1614 between HTCM and outside air valve actuator.
- If circuit ok, replace HTCM.

No

Replace outside air valve actuator.

CamScanner

DTC 21 – WINDSHIELD ON COMMAND OUTPUT FAILURE



PSMELC68184AC

WINDSHIELD ON COMMAND OUTPUT FAILURE

The accessory power module (APM) heated windshield power is commanded by the HPVS/thermal control module (HTCM) via a discrete digital interface. If this circuit fails open, the fault will be set, the SERVICE SOON telltale is turned On, and APM will the keep the windshield on always. If it fails shorted, the windshield will not come On and the failure will be detected the next time windshield clearing is requested.

DTC PARAMETERS

DTC 21 will set if:

- Open or short to ground in the windshield on command circuit.
- Open or short in APM 12V status hit 0 circuit 1262.

DTC 21 will set when:

- Anytime the APM status indicates that the HTCM commanded state does not match the APM reported state.
- Anytime HTCM 41 is set. (APM turns Off heated windshield feedback.)

FAILURE ACTION

This DTC will be Jogged. If the failure is an open circuit, the windshield will always be On, regardless of the run/lock shift assembly (RSA) request. If the failure is a short to ground, the windshield will never be On, regardless of the RSA request.

RELATED DTCS

HTCM 41.

TELLTALE ILLUMINATED:

Service Soon

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

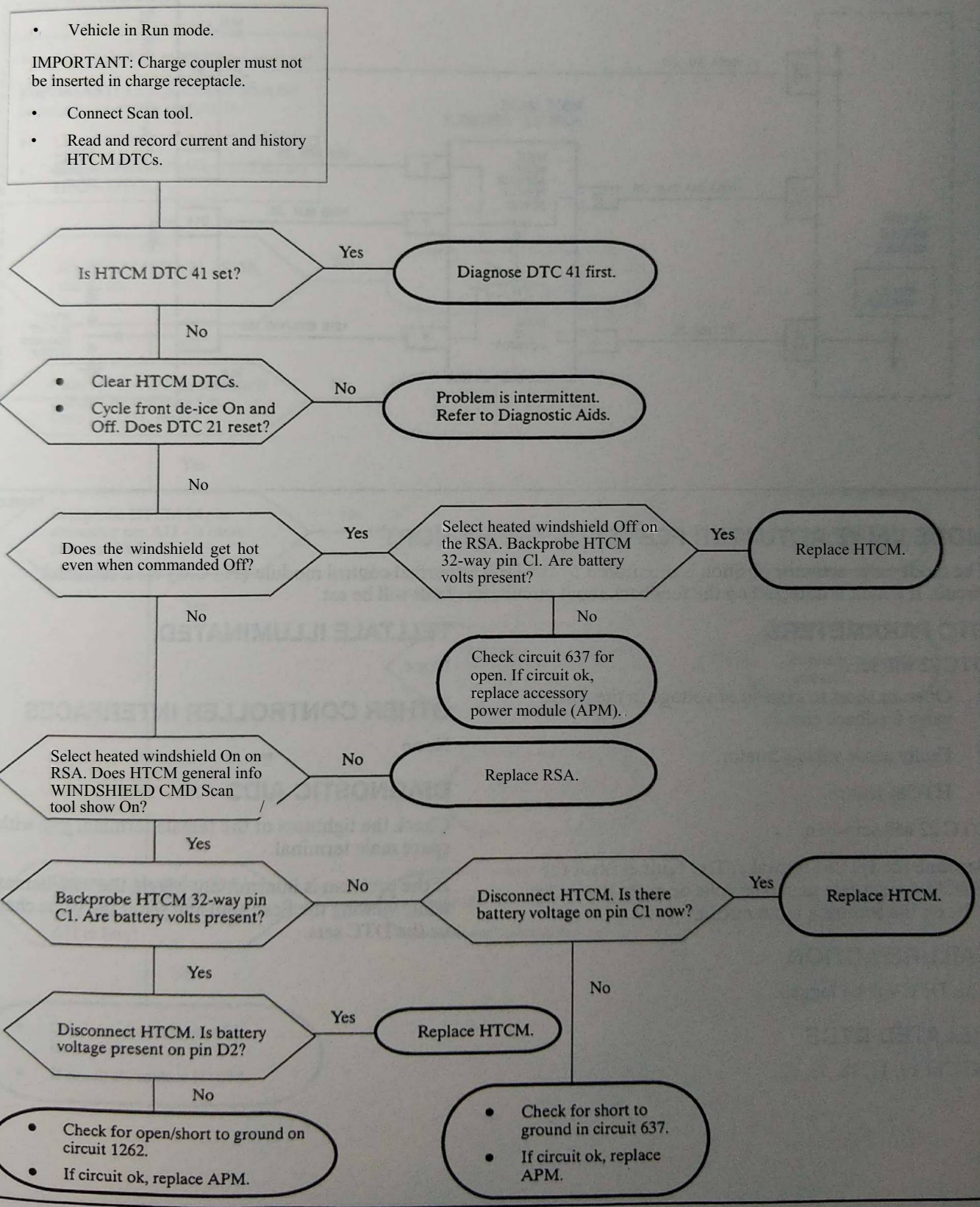
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

Windshield is commanded On anytime voltage is above 8.0 volts. It is commanded Off when the voltage is below 2.5 volts.

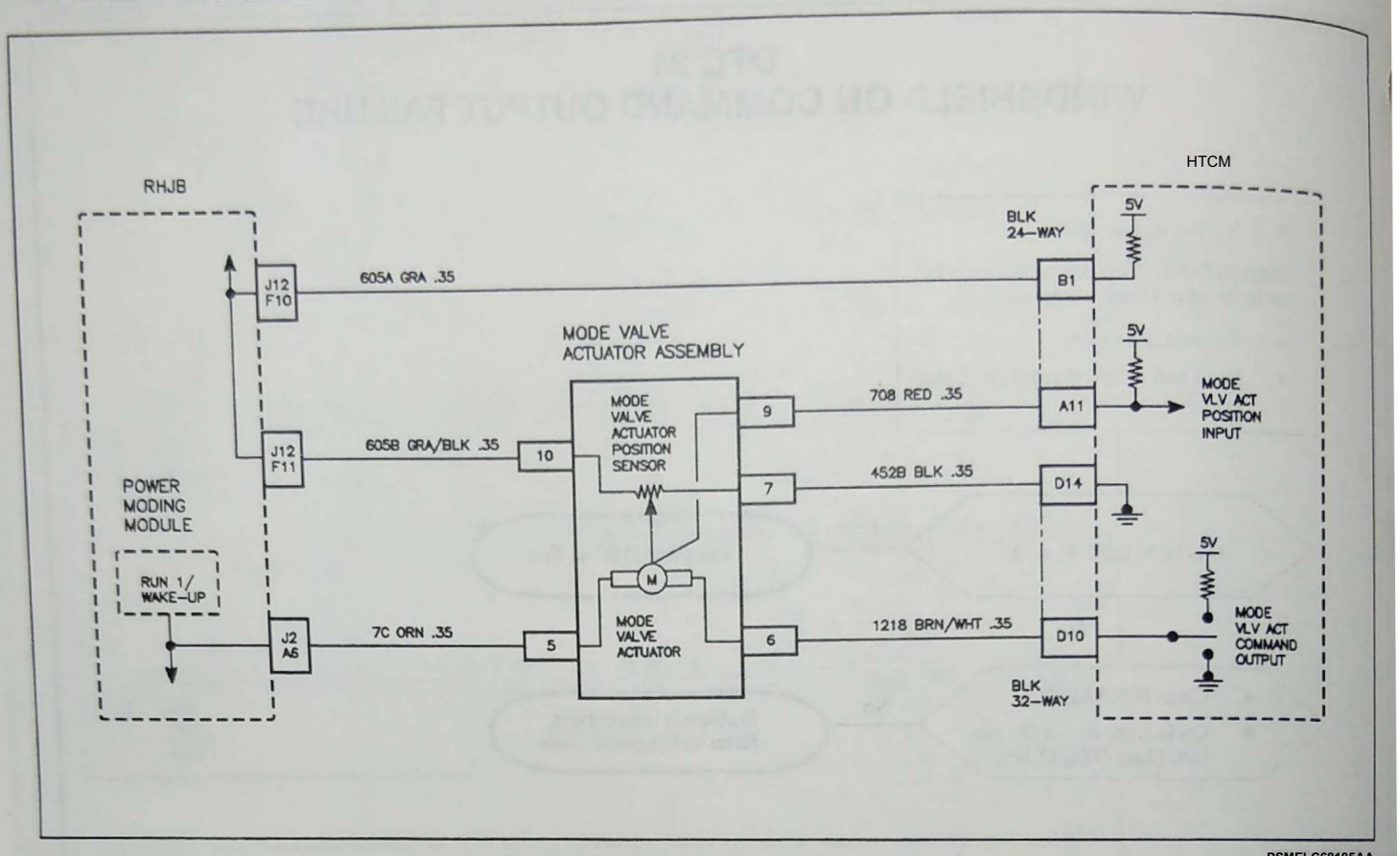
CamScanner

DTC21
WINDSHIELD ON COMMAND OUTPUT FAILURE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Is HTCM DTC 41 set?
Yes
Diagnose DTC 41 first.
No
• Clear HTCM DTCs.
• Cycle front de-ice On and Off. Does DTC 21 reset?
No
Problem is intermittent. Refer to Diagnostic Aids.
No
Does the windshield get hot even when commanded Off?
Yes
Select heated windshield Off on the RSA. Backprobe HTCM 32-way pin C1. Are battery volts present?
Yes
Replace HTCM.
No
No
Check circuit 637 for open. If circuit ok, replace accessory power module (APM).
Select heated windshield On on RSA. Does HTCM general info WINDSHIELD CMD Scan tool show On?
No
Replace RSA.
Yes
Backprobe HTCM 32-way pin C1. Are battery volts present?
No
Disconnect HTCM. Is there battery voltage on pin C1 now?
Yes
Replace HTCM.
Yes
No
Disconnect HTCM. Is battery voltage present on pin D2?
Yes
Replace HTCM.
No
• Check for open/short to ground on circuit 1262.
• If circuit ok, replace APM.
• Check for short to ground in circuit 637.
• If circuit ok, replace APM.

CamScanner

DTC 22 - MODE VALVE ACTUATOR FEEDBACK OPEN/SHORT



PSMELC68185AA

MODE VALVE ACTUATOR FEEDBACK OPEN/SHORT

The mode valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If a fault is detected on the feedback input circuit, this fault will be set.

DTC PARAMETERS

DTC 22 will set if:

- Open or short to ground or voltage in the mode valve feedback circuit.
- Faulty mode valve actuator.
- HTCM failure.

DTC 22 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts or more than 4.88 volts on the feedback input circuit.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

HTCM 10,11,18, 58,62.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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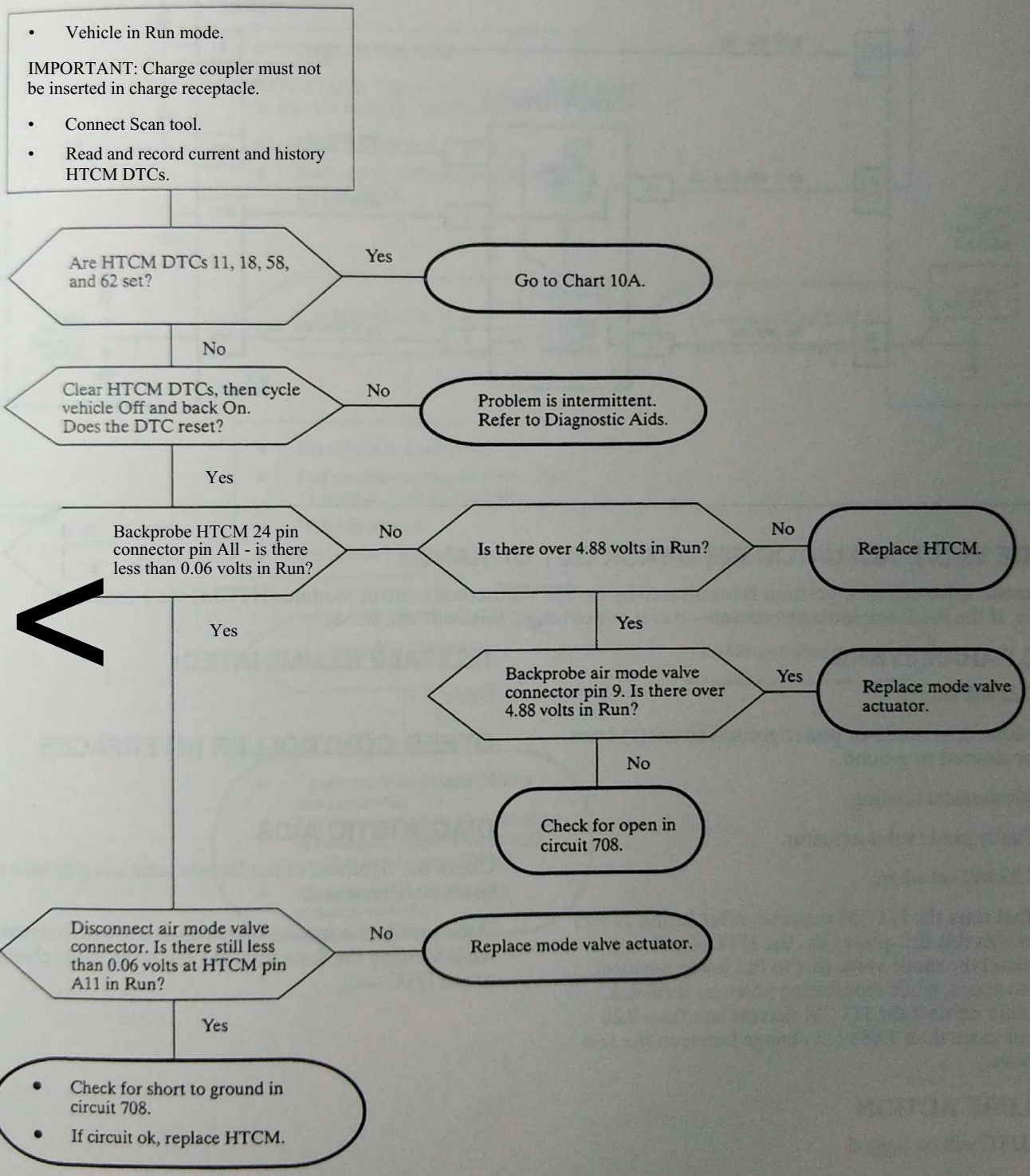
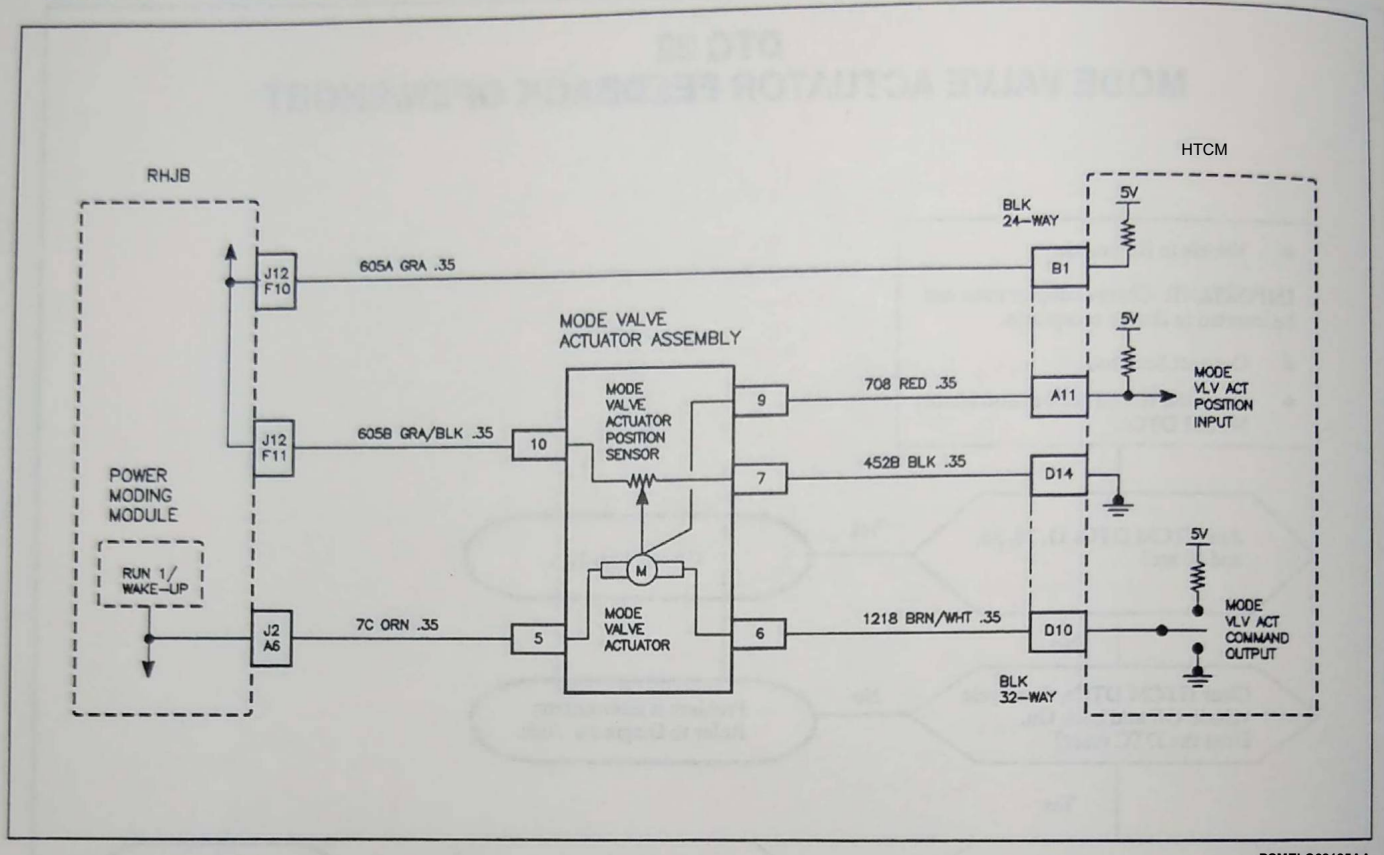
DTC 22
MODE VALVE ACTUATOR FEEDBACK OPEN/SHORT


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Are HTCM DTCs 11, 18, 58, and 62 set?
Yes
Go to Chart 10A.
No
Clear HTCM DTCs, then cycle vehicle Off and back On. Does the DTC reset?
No
Problem is intermittent. Refer to Diagnostic Aids.
Yes
Backprobe HTCM 24 pin connector pin All - is there less than 0.06 volts in Run?
No
Is there over 4.88 volts in Run?
No
Replace HTCM.
Yes
Yes
Backprobe air mode valve connector pin 9. Is there over 4.88 volts in Run?
Yes
Replace mode valve actuator.
No
Check for open in circuit 708.
Disconnect air mode valve connector. Is there still less than 0.06 volts at HTCM pin A11 in Run?
No
Replace mode valve actuator.
Yes
• Check for short to ground in circuit 708.
• If circuit ok, replace HTCM.

CamScanner

DTC 23 - MODE VALVE ACTUATOR FEEDBACK OUT OF RANGE



PSMELC68185AA

MODE VALVE ACTUATOR FEEDBACK OUT OF RANGE

The mode valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If the feedback indicates actuator travel out of range, this fault will be set.

DTC PARAMETERS

DTC 23 will set if:

- Mode door actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty mode valve actuator.

DTC 23 will set when:

The first time the HTCM is awake, after losing 12 volt power. On this first power up, the HTCM will command the mode valve first to the lower position, then to upper, while monitoring position feedback This fault exists if the HTCM detects less than 0.20 volts or more than 4.88 volts change between the two positions.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

HTCM 24.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 23
MODE VALVE FEEDBACK OUT OF RANGE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Is HTCM DTC 24 set? — Yes → Refer to HTCM DTC 24.

No

- Put vehicle in Lock mode.
- Pull auxiliary battery maxifuse. Wait 15 seconds. Reinstall maxifuse.
- Wait one minute.
- Put vehicle back in Run mode.

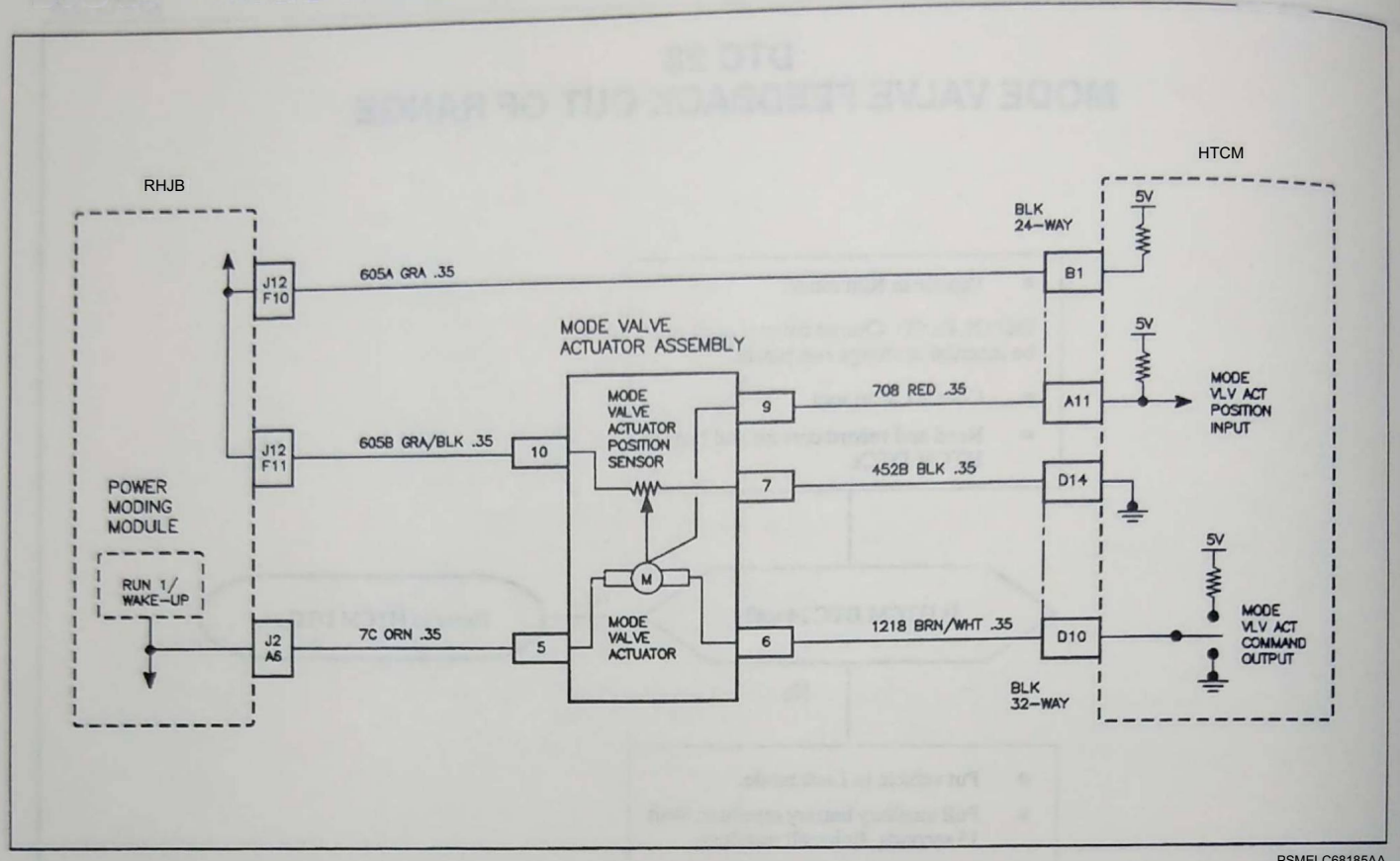
Does DTC 23 reset? — No → Vehicle operating normally.

Yes

- Check mode actuator and door mechanism for binding/misalignment/broken stops. If damaged, replace heat pumpO ventilation module (HPVM).
- If all ok, replace mode valve actuator assembly.

CamScanner

DTC 24 - MODFVALVE ACTUATOR NOT RESPONDING



PSMELC68185AA

MODE VALVE ACTUATOR NOT RESPONDING

The mode valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If the feedback indicates that the actuator did not respond properly to a command, this fault will be set.

DTC PARAMETERS

DTC 24 will set if:

- Mode valve actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty mode valve actuator.

DTC 24 will set when:

Anytime the mode valve feedback indicates that the mode door did not reach the commanded position.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

HTCM 22, 23.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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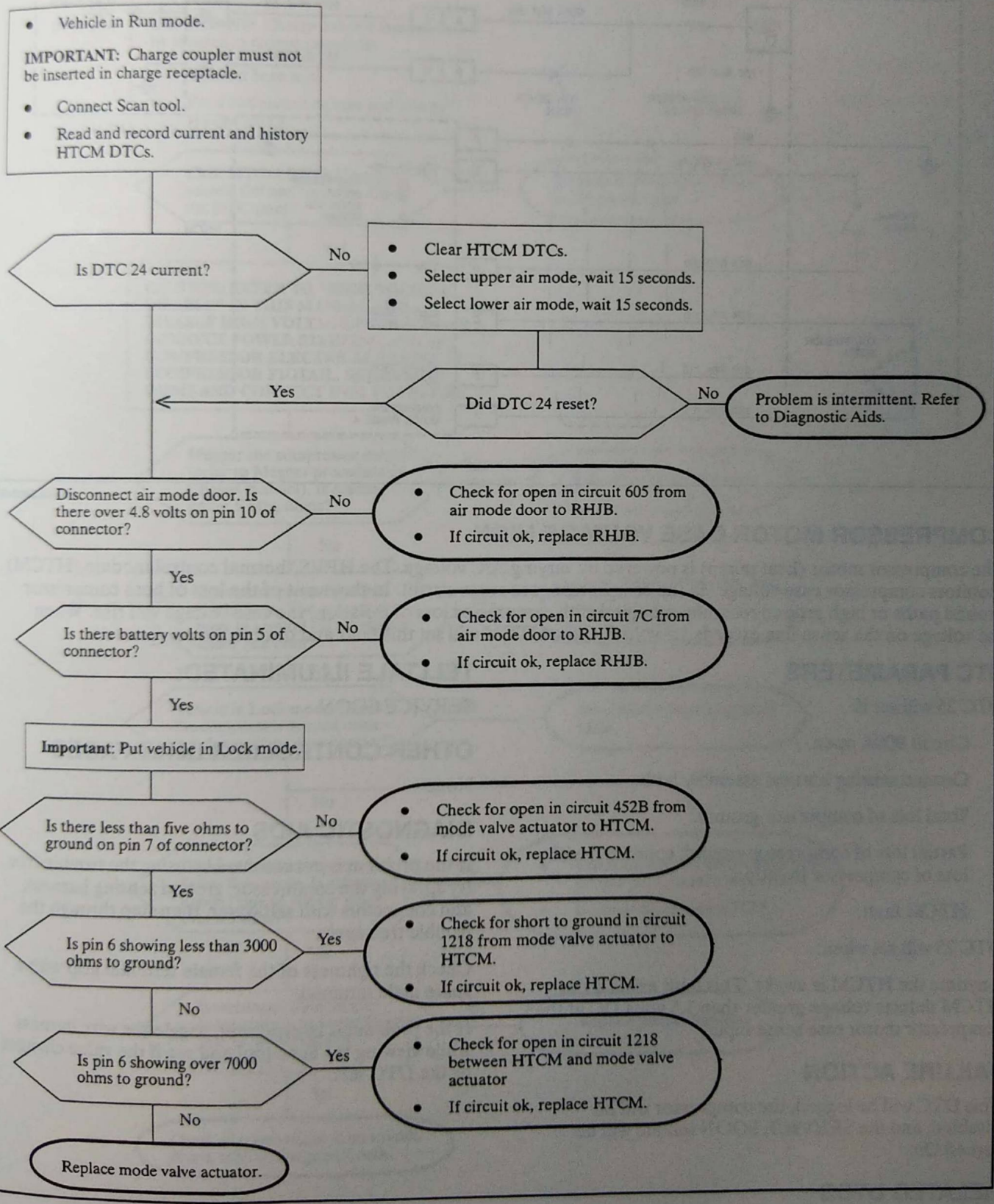
DTC 24
MODE VALVE NOT RESPONDING


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Is DTC 24 current?
No
• Clear HTCM DTCs.
• Select upper air mode, wait 15 seconds.
• Select lower air mode, wait 15 seconds.
Did DTC 24 reset?
Yes
No
Problem is intermittent. Refer to Diagnostic Aids.
Disconnect air mode door. Is there over 4.8 volts on pin 10 of connector?
No
• Check for open in circuit 605 from air mode door to RHJB.
• If circuit ok, replace RHJB.
Yes
Is there battery volts on pin 5 of connector?
No
• Check for open in circuit 7C from air mode door to RHJB.
• If circuit ok, replace RHJB.
Yes
Important: Put vehicle in Lock mode.
Is there less than five ohms to ground on pin 7 of connector?
No
• Check for open in circuit 452B from mode valve actuator to HTCM.
• If circuit ok, replace HTCM.
Yes
Is pin 6 showing less than 3000 ohms to ground?
Yes
• Check for short to ground in circuit 1218 from mode valve actuator to HTCM.
• If circuit ok, replace HTCM.
No
Is pin 6 showing over 7000 ohms to ground?
Yes
• Check for open in circuit 1218 between HTCM and mode valve actuator
• If circuit ok, replace HTCM.
No
Replace mode valve actuator.

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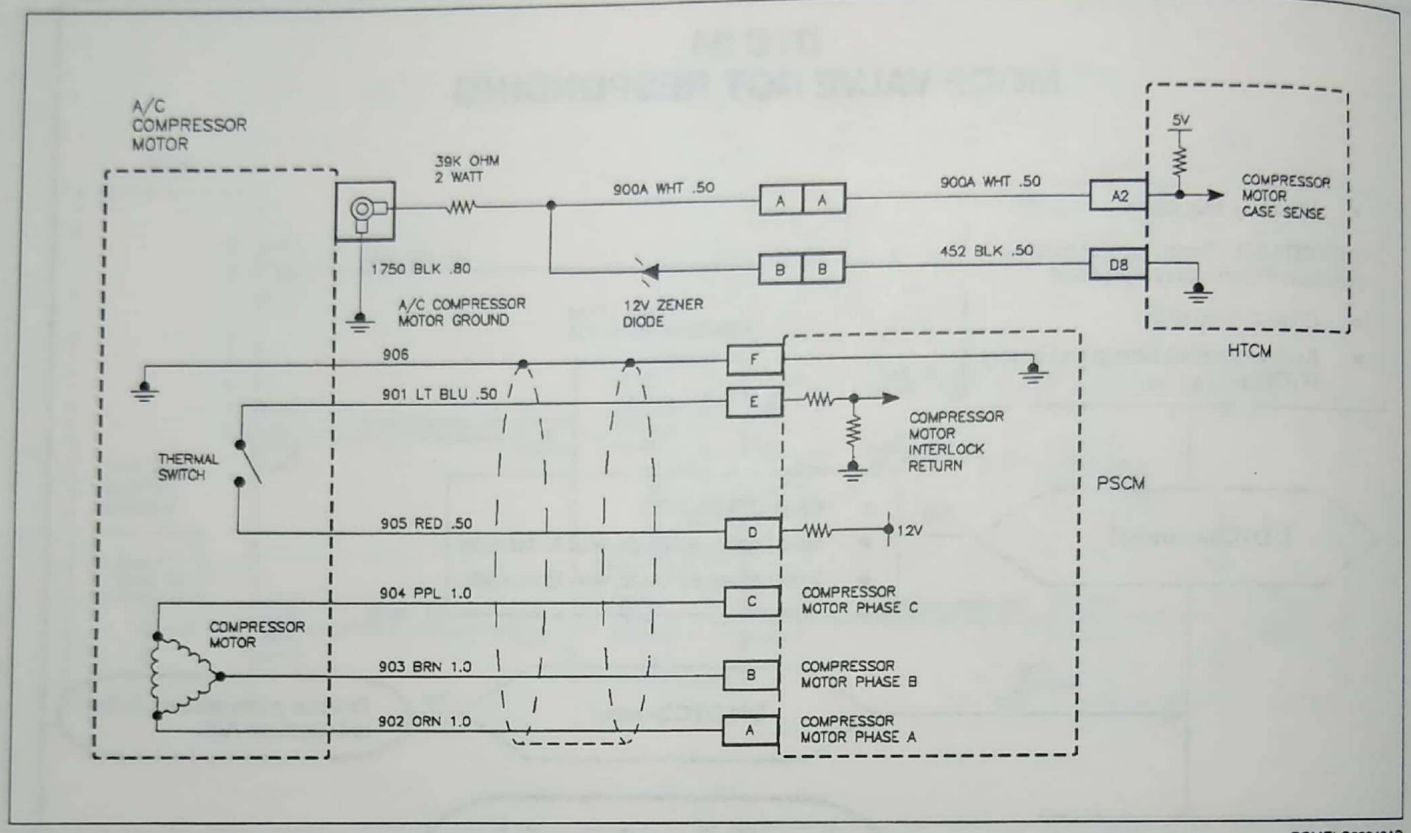
DTC 25 – COMPRESSOR MOTOR CASE VOLTAGE HIGH



PSMELC68343AB

COMPRESSOR MOTOR CASE VOLTAGE HIGH

The compressor motor (heat pump) is powered by varying A/C voltage. The HPVS/thermal control module (HTCM) monitors compressor case voltage via the compressor case sense circuit. In the event of the loss of both compressor ground paths or high ground resistance coupled with compressor loss of isolation, the case voltage will rise. When the voltage on the sense line exceeds 1.5 volts DC the HTCM will set this fault and disable the compressor.

DTC PARAMETERS

DTC 25 will set if:

- Circuit 900A open.
- Ground sensing harness assembly fault.
- Total loss of compressor ground.
- Partial loss of compressor ground, combined with loss of compressor isolation.
- HTCM fault.

DTC 25 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects voltage greater than 1.5 volts DC at the compressor motor case sense input.

FAILURE ACTION

This DTC will be logged, the compressor will be disabled, and the SERVICE SOON telltale will be turned On.

RELATED DTCS

None

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

If the problem is not resolved by using the trouble tree, try spraying the compressor, ground sensing harness, and connectors with salt water, then step through the trouble tree again.

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harnes^ while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 25
COMPRESSOR MOTOR CASE VOLTAGE HIGH

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Clear HTCM DTCs, then cycle vehicle Off and back On. Does the DTC reset?

No → Problem is intermittent. Refer A to Diagnostic Aids.

Yes

CAUTION: REFER TO "HIGH VOLTAGE DISABLE IN THIS MANUAL AND DIS ABLE HIGH VOLTAGE. VEHICLE OFF. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DVM TO OHMS AND CONNECT DVM TO TESTER.**

Megger the compressor motor (refer to Megger procedure in Chassis manual). Is reading under 5 Meg ohms?

Yes → Replace compressor motor^^^

No

Check compressor ground shield from. The connector body to ground • is resistance under one ohm?

No → Replace compressor moton^^

Yes

Vehicle in Lock mode. Check the compressor ground cable - is it damaged or disconnected?^

Yes → Reconnect or replace ground A cable.

No

Disconnect harness jumper. Select Run mode. Is voltage at harness side of jumper pin A over 4.5 volts?

No →
- Check for open in circuit 900A from jumper pin A to HTCM pin A2.
- If circuit ok, replace HTCM.

Yes

Is resistance from jumper harness pin A to power steering case between 35k and 45k ohms?

No → Replace jumper hamess/^^

Yes

[Check all connections. If no trouble found, refer to Diagnostic Aids.

CamScanner

DTC 26 - PRECONDITIONING ABORTED

When preconditioning is properly set, and a service charge module is connected to the charge receptacle, the HPVS/thermal control module (HTCM) will wake up approximately 15 minutes before the programmed precondition time. The battery[7] pack module will inform the HTCM (via normal mode serial data) if preconditioning was scheduled, but did not take place.

DTC PARAMETERS

DTC 26 will set if:

Anytime that preconditioning is aborted.

DTC 26 will set when:

Preconditioning does not occur (or is aborted) for any of the following reasons:

- Battery pack state of charge below 80%.
- The vehicle is not connected to an service charger module (SCM).
- The automatic disconnect opens.

FAILURE ACTION

This DTC will be logged.

RELATED DTCS

None

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

This DTC is a status indicator and not a failure indicator. No parts should be replaced for this DTC. If there is a problem with the vehicle other DTCs should be set.

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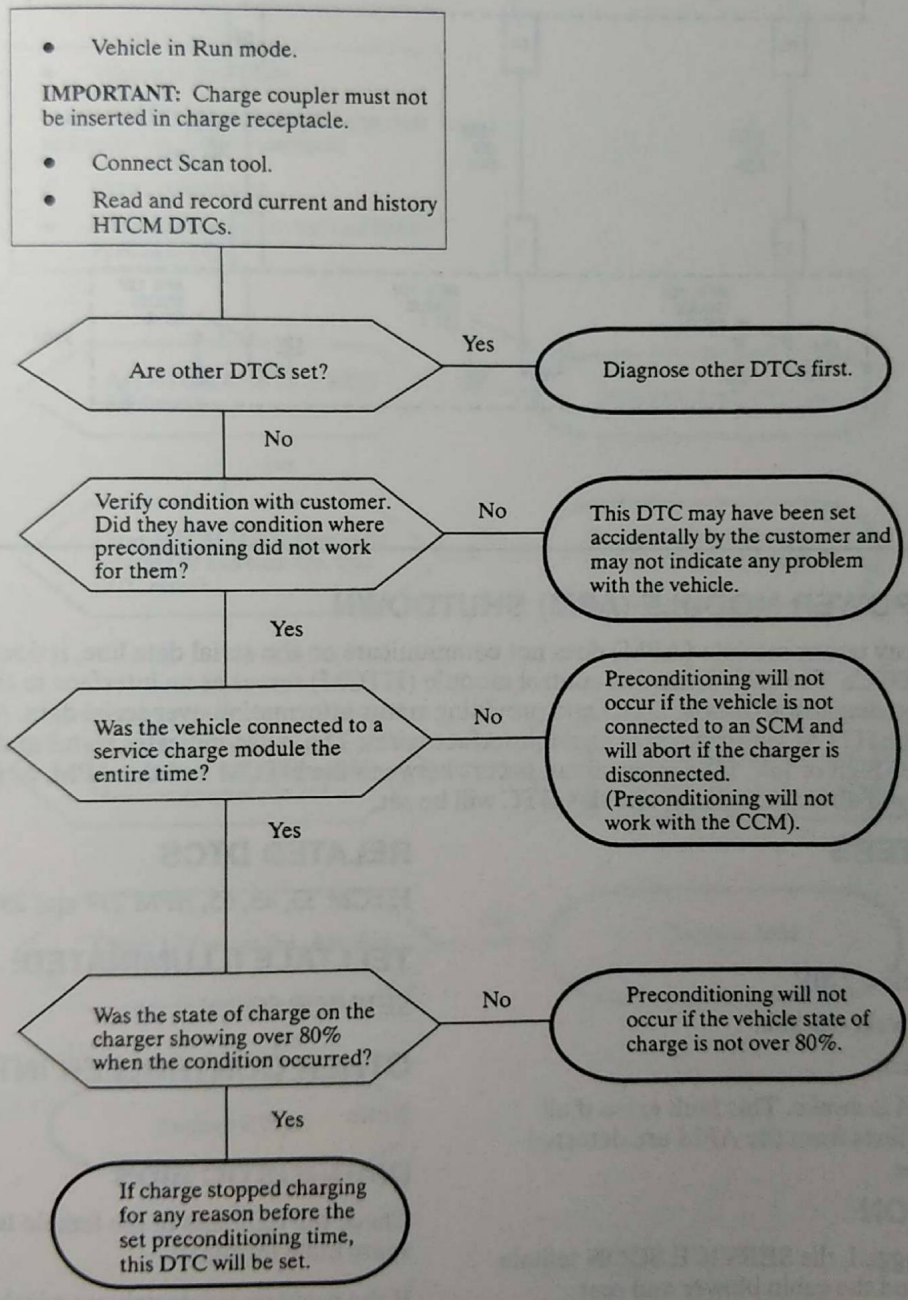
DTC 26
PRECONDITIONING ABORTED


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Are other DTCs set?
Yes
Diagnose other DTCs first.
No
Verify condition with customer. Did they have condition where preconditioning did not work for them?
No
This DTC may have been set accidentally by the customer and may not indicate any problem with the vehicle.
Yes
Was the vehicle connected to a service charge module the entire time?
No
Preconditioning will not occur if the vehicle is not connected to an SCM and will abort if the charger is disconnected. (Preconditioning will not work with the CCM).
Yes
Was the state of charge on the charger showing over 80% when the condition occurred?
No
Preconditioning will not occur if the vehicle state of charge is not over 80%.
Yes
If charge stopped charging for any reason before the set preconditioning time, this DTC will be set.

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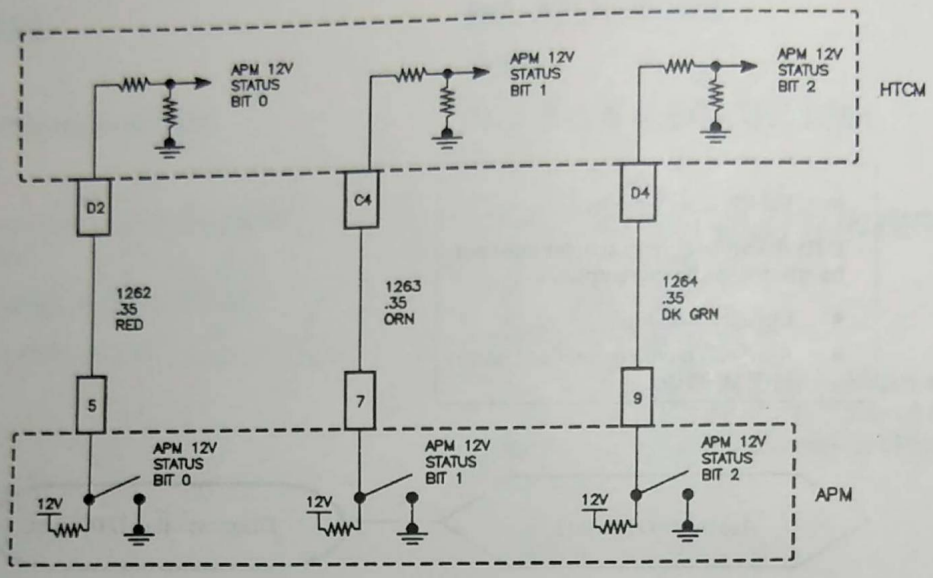
DTC 27 – ACCESSORY POWER MODULE (APM) SHUTDOWN



PSMELC68186AA

ACCESSORY POWER MODULE (APM) SHUTDOWN

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. If an open circuit occurs between the HTCM and the APM, or if the APM shuts down, these inputs will all be pulled low, and this DTC will be set.

DTC PARAMETERS

DTC 27 will set if:

- APM fault.
- Pack voltage below 220V.
- Loose or open wake-up line.

DTC 27 will set when:

Anytime the HTCM is awake. This fault exists if all three 12 volt status lines from the APM are detected low at the same time.

FAILURE ACTION

This DTC will be logged, the SERVICE SOON telltale will be turned on, and the cabin blower and rear defogger will be disabled. In addition, the failure status will be communicated (via normal mode serial data) to the Battery Pack Module <BPM)> which will log a BPM DTC 296, and disable charging.

RELATED DTCS

HTCM 33, 43, 65, BPM 274 and 296.

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

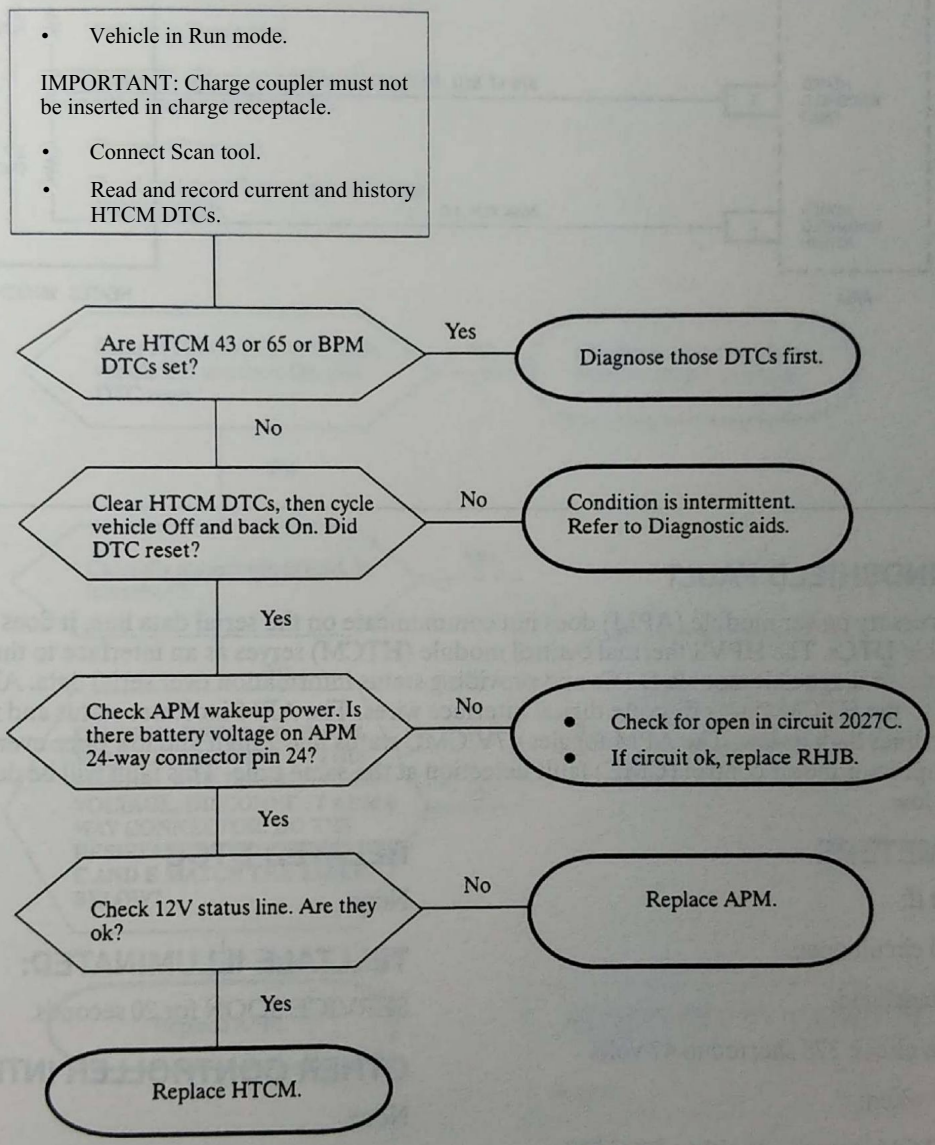
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

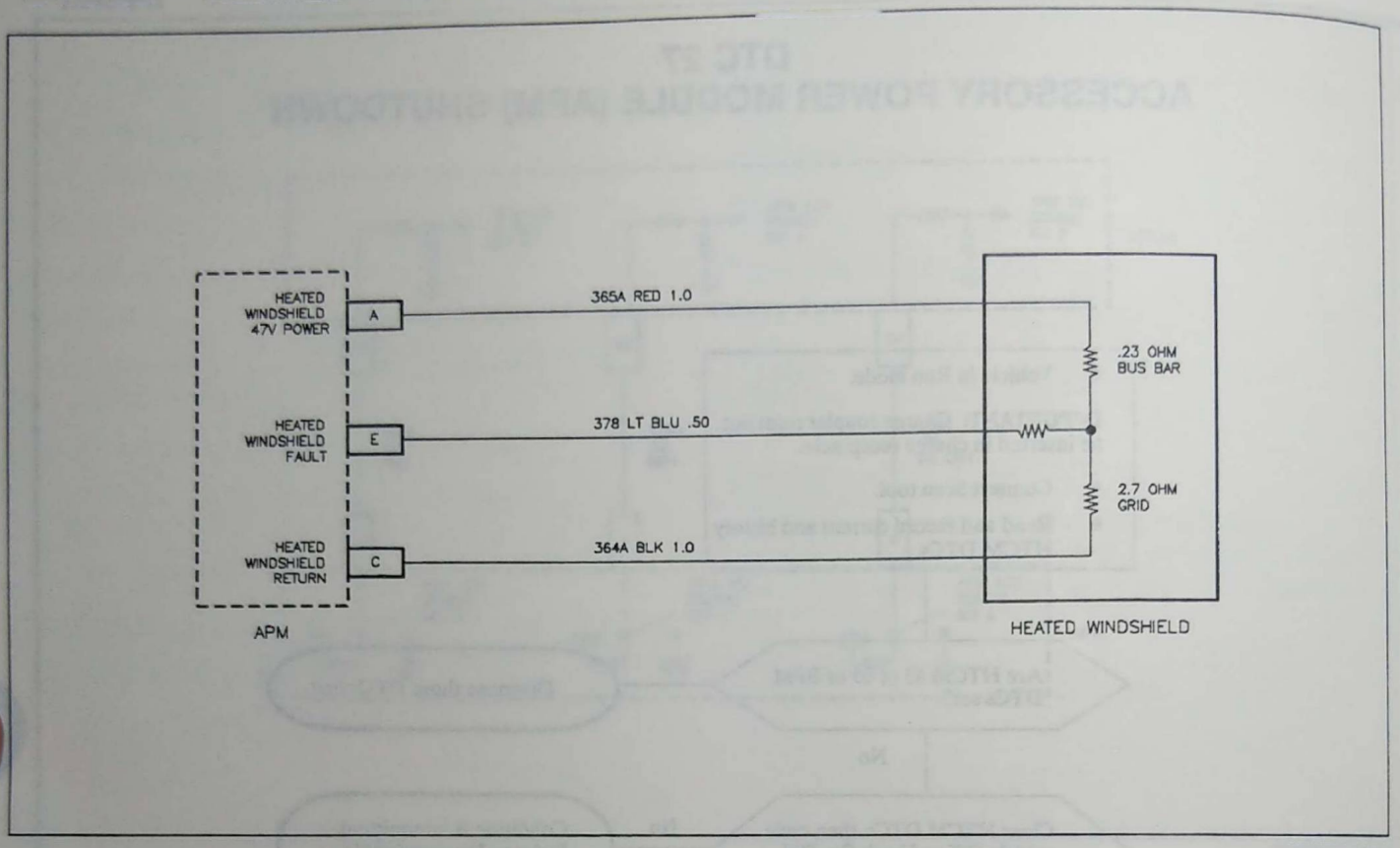
CamScanner

DTC 27
ACCESSORY POWER MODULE (APM) SHUTDOWN


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Are HTCM 43 or 65 or BPM DTCs set?
Yes
Diagnose those DTCs first.
No
Clear HTCM DTCs, then cycle vehicle Off and back On. Did DTC reset?
No
Condition is intermittent. Refer to Diagnostic aids.
Yes
Check APM wakeup power. Is there battery voltage on APM 24-way connector pin 24?
No
• Check for open in circuit 2027C.
• If circuit ok, replace RHJB.
Yes
Check 12V status line. Are they ok?
No
Replace APM.
Yes
Replace HTCM.

CamScanner

DTC 28 - HEATED WINDSHIELD FAULT



PSMELC68344AA

HEATED WINDSHIELD FAULT

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once every second to allow 47 volt and compressor motor control (CMC) fault detection at the same time. This fault will be detected if all three status lines are low.

DTC PARAMETERS

DTC 28 will set if:

- Windshield circuit open.
- Cracked windshield.
- Crack sense circuit 378 shorted to 47 volts.

DTC 28 will set when:

Anytime the HTCM is awake. If either DTC 027 (APM shutdown) or DTC 043 (auto disconnect open) are set, this fault will not set.

FAILURE ACTION

T^S$_u$DTC WIU be logged'the SERVICE SOON telltale will be turned On for 20 seconds, windshield clearing functions will be disabled, front defog, front de-ice ^{B} LEDs are turned Off.

RELATED DTCS

None

TELLTALE ILLUMINATED:

SERVICE SOON for 20 seconds.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC 28
HEATED WINDSHIELD FAULT

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Clear HTCM DTCs, then cycle vehicle Off and back On. Did DTC reset?

No → Condition is intermittent, Refer to Diagnostic Aids.

Yes

Carefully inspect windshield. Is it cracked?

Yes → Replace windshield, verify DTC does not reset.

No

CAUTION: REFER TO "HIGH VOLTAGE DISABLE" IN THIS MANUAL AND DISABLE HIGH VOLTAGE. DISCONNECT APM 6 WAY CONNECTOR. DO THE RESISTANCES ACROSS PINS A, C AND E MATCH THE TABLE BELOW?

No

Yes

C Replace APM.

RESISTANCE READINGS AT 25'C	
A to C	2.7 - 3.1 ohms
A to E	4.1 -4.8 ohms
CtoE	6.4 - 7.4 ohms
A to Ground	Open

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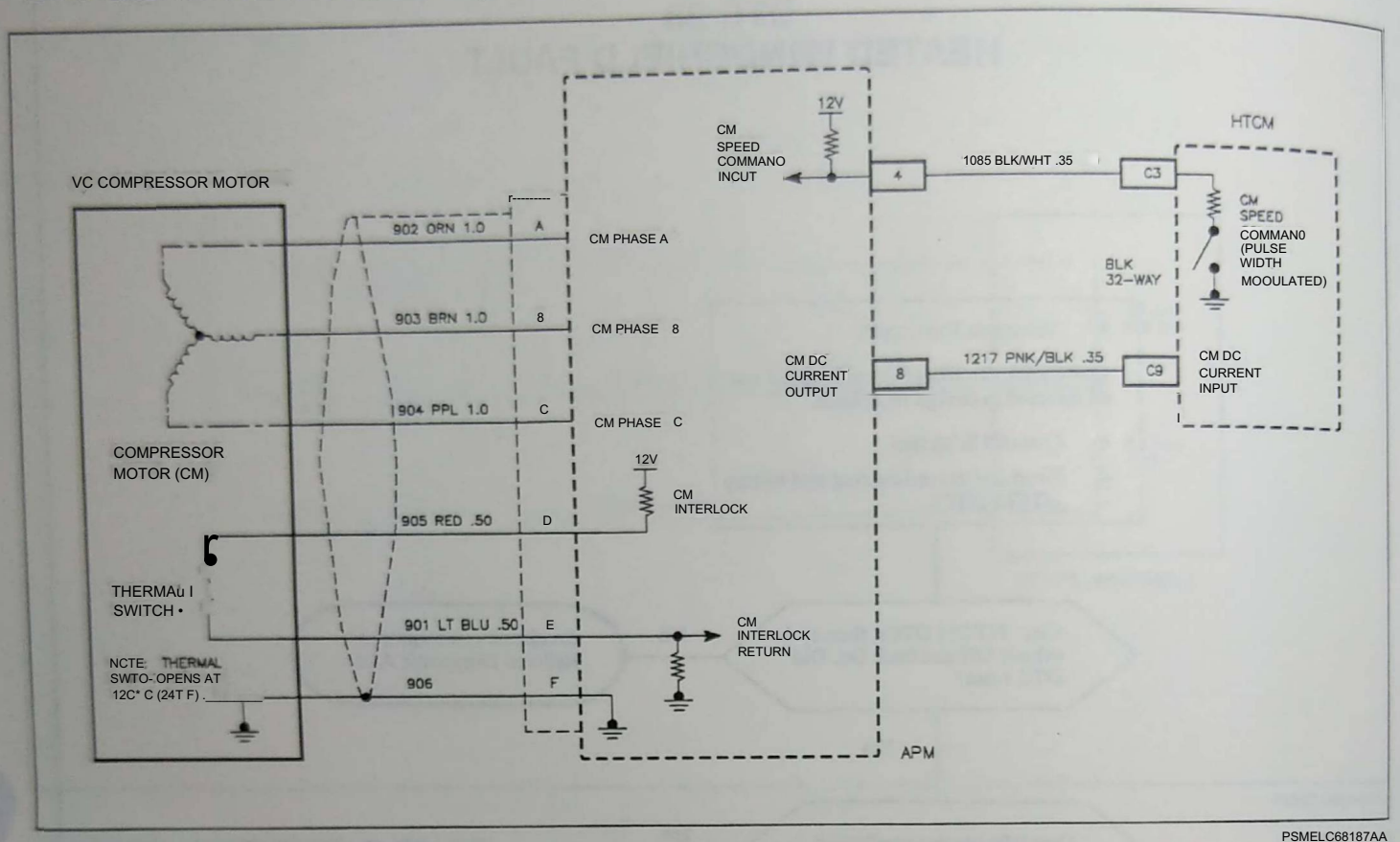
DTC 29 - COMPRESSOR MOTOR CONTROL (CMC) ISOLATED GATE BI-POLAR TRANSISTOR (IGBT) FAULT #1



PSMELC68187AA

COMPRESSOR MOTOR CONTROL (CMC) ISOLATED GATE BI-POLAR TRANSISTOR (IGBT) FAULT #1

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM bv storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once every second to allow 47 voit and CMC fault detection at the same time. If the CMC detects an over current or over temperature failure, this fault wil] be reported.

DTC PARAMETERS

DTC 29 will set if:

- Open circuit on any of the three compressor motor phases. Short between any of the three compressor motor phases and ground.
- Motor phase to interlock short.
- Short between any of the three compressor motor phases and another phase.
- Seized compressor.
- Restriction in A/C system.
- Auxiliary power module (IGBT failure).

DTC 29 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects an overcurrent or IGBT overtemp condition, the HTCM will be informed (via the discrete digital interface lines). The HTCM will attempt to reset the CMC three times. If the CMC resumes operation, this fault will be set. The third failure will result in an HTCM 030 being set.

FAILURE ACTION

This DTC will be logged, and the heat pump will be disabled while the fault is present.

RELATED DTCS

HTCM 25, 30.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

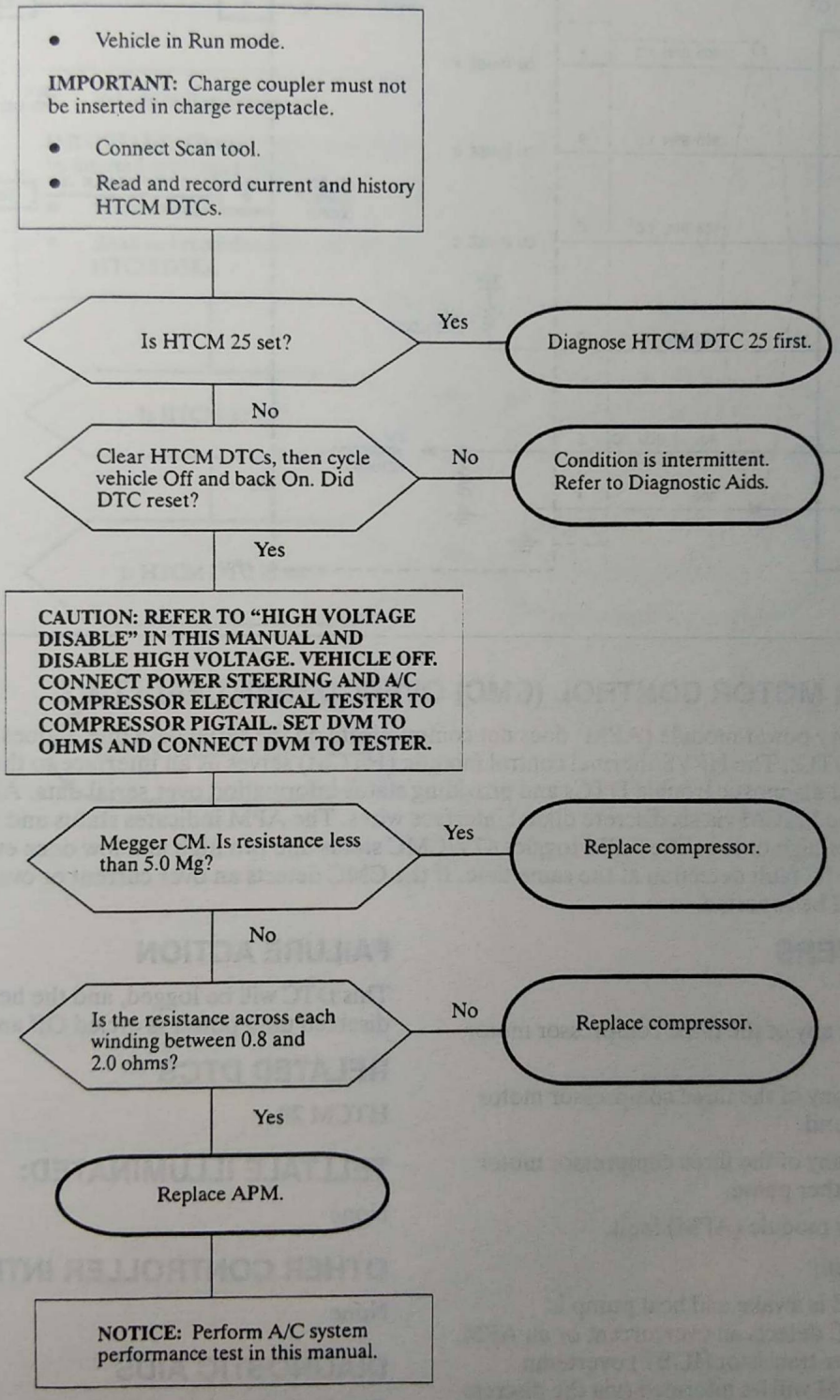
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire ^aJ^anges ess while viewing the Scan tool and see if the valu or the DTC sets.

CamScanner

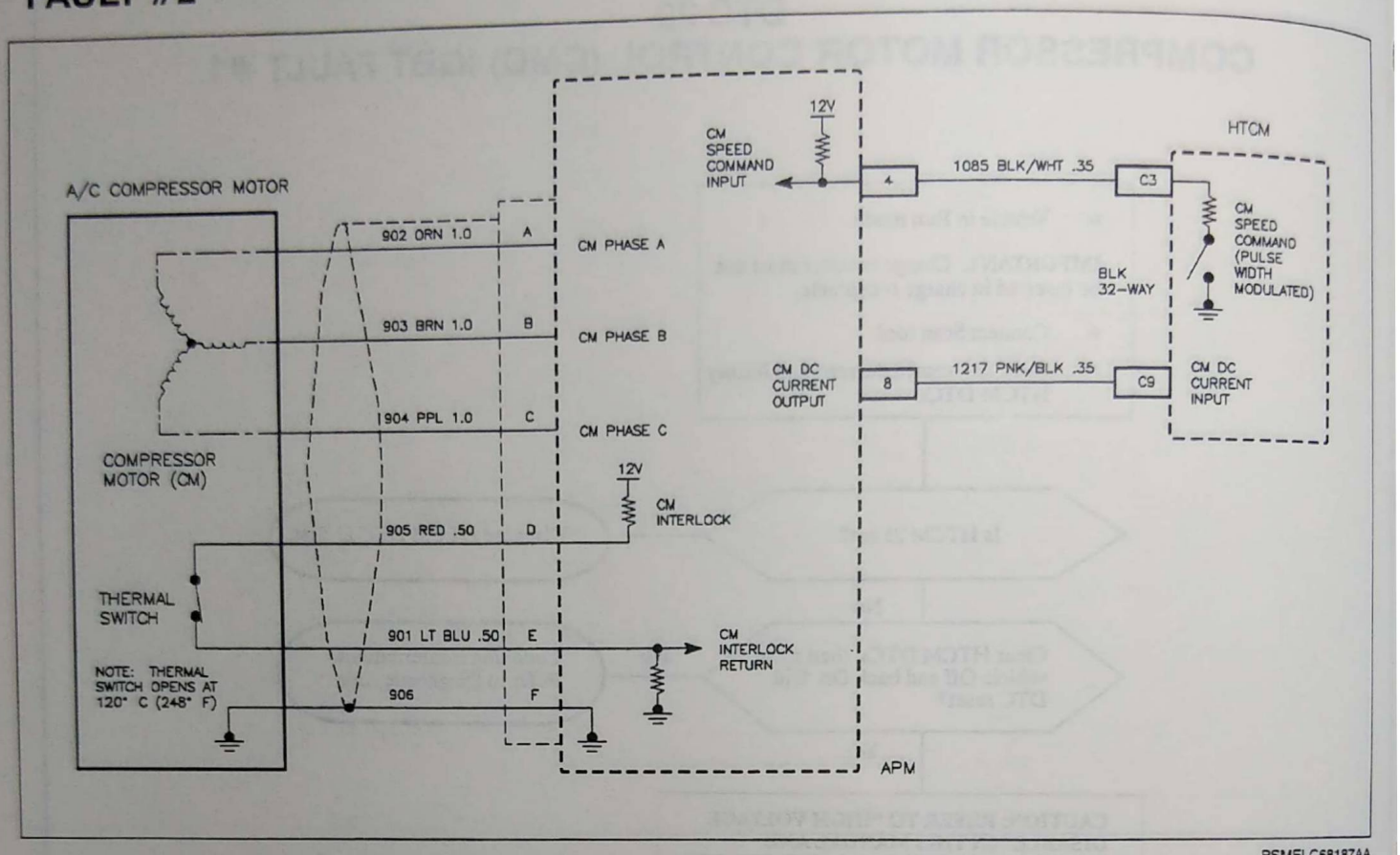
DTC 29
COMPRESSOR MOTOR CONTROL (CMC) IGBT FAULT #1


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Is HTCM 25 set?
Yes
Diagnose HTCM DTC 25 first.
No
Clear HTCM DTCs, then cycle vehicle Off and back On. Did DTC reset?
No
Condition is intermittent. Refer to Diagnostic Aids.
Yes
CAUTION: REFER TO "HIGH VOLTAGE DISABLE" IN THIS MANUAL AND DISABLE HIGH VOLTAGE. VEHICLE OFF. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DVM TO OHMS AND CONNECT DVM TO TESTER.
Megger CM. Is resistance less than 5.0 Mg?
Yes
Replace compressor.
No
Is the resistance across each winding between 0.8 and 2.0 ohms?
No
Replace compressor.
Yes
Replace APM.
NOTICE: Perform A/C system performance test in this manual.

CamScanner

DTC 30 - COMPRESSOR MOTOR CONTROL (CMC) OVERCURRENT

FAULT #2



PSMELC68187AA

COMPRESSOR MOTOR CONTROL (CMC) OVERCURRENT FAULT #2

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line two high and low once every second to allow 47 volt and CMC fault detection at the same time. If the CMC detects an over current or over temperature failure, this fault will be reported.

DTC PARAMETERS

DTC 30 will set if:

- Open circuit on any of the three compressor motor phases.
- Short between any of the three compressor motor phases and ground.
- Short between any of the three compressor motor phases and another phase.
- Auxiliary power module (APM) fault.

DTC 30 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects an overcurrent or an APM isolated gate bi-polar transistor (IGBT) overtemp condition, the HTCM will be informed (via the discrete digital interface lines. The HTCM will attempt to reset the CMC three times. If the CMC resumes normal operation, an HTCM DTC 29 will be set. The third failure will result in an HTCM DTC 30 being set

FAILURE ACTION

This DTC will be logged, and the heat pump will be disabled until power is cycled Off and On.

RELATED DTCS

HTCM 29.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

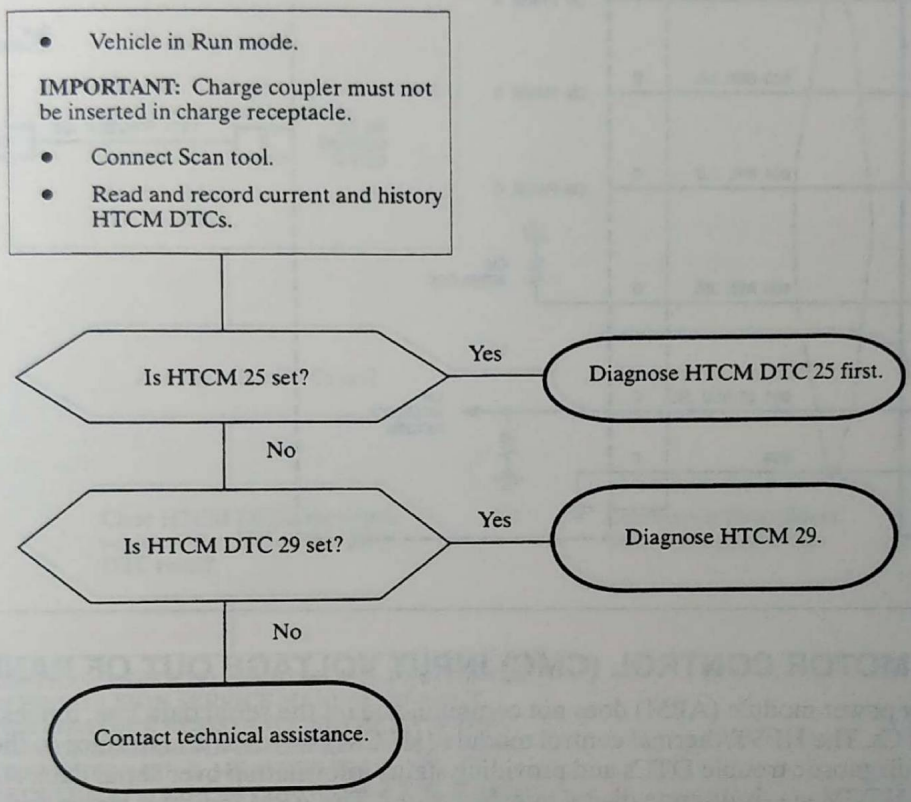
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value change or the DTC sets.

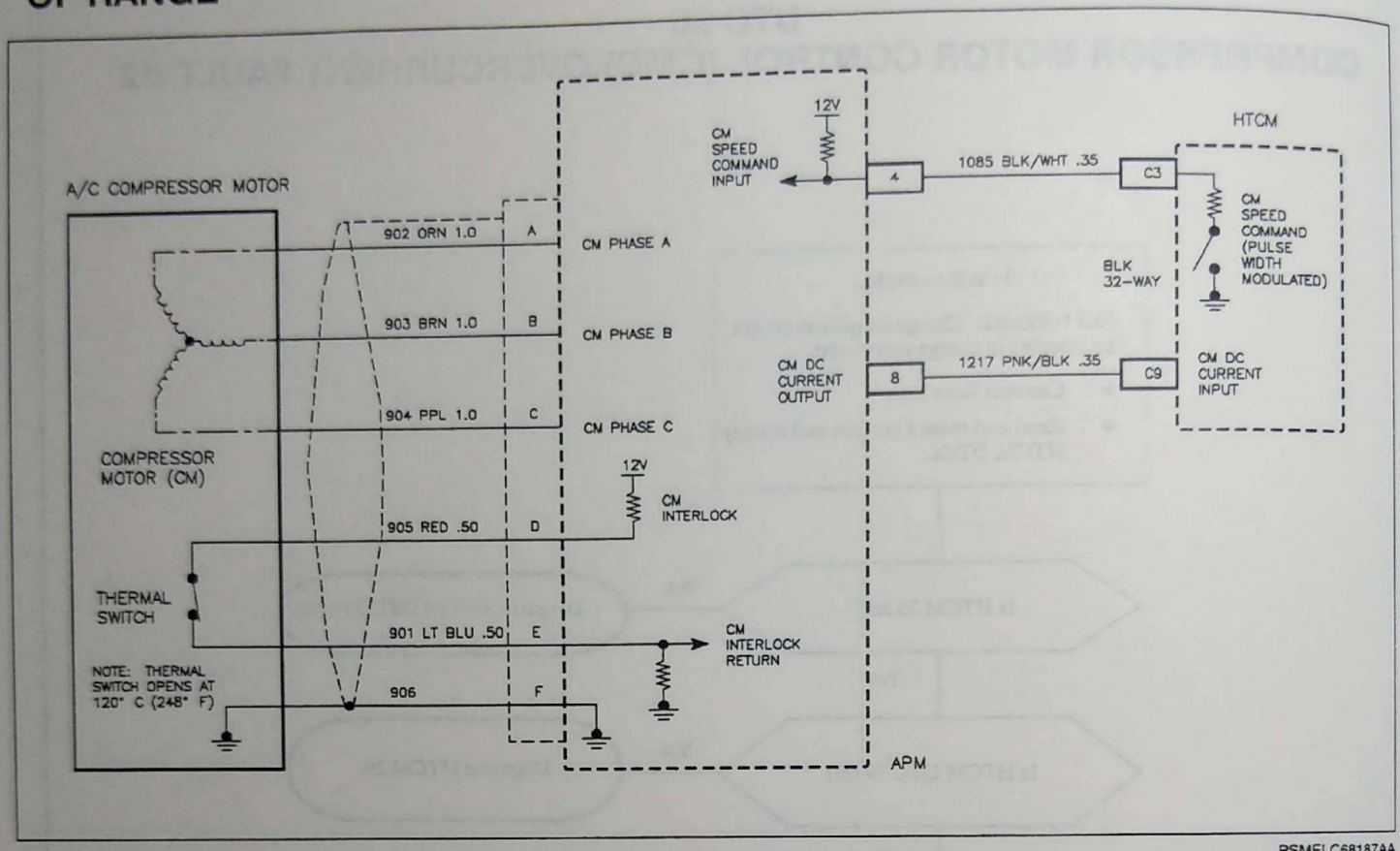
CamScanner

DTC 30
COMPRESSOR MOTOR CONTROL (CMC) OVERCURRENT FAULT #2


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Is HTCM 25 set?
Yes
Diagnose HTCM DTC 25 first.
No
Is HTCM DTC 29 set?
Yes
Diagnose HTCM 29.
No
Contact technical assistance.

CamScanner

DTC 31 - COMPRESSOR MOTOR CONTROL (CMC) INPUT VOLTAGE OUT OF RANGE



PSMELC68187AA

COMPRESSOR MOTOR CONTROL (CMC) INPUT VOLTAGE OUT OF RANGE

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once every second to allow 47 volt and CMC fault detection at the same time. If the CMC detects the input voltage out of range, this fault will be reported.

DTC PARAMETERS

DTC 31 will set if:

- Battery pack low state of charge.
- Battery pack voltage too high (this could occur during preconditioning or re gen).

DTC 31 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects input voltage above 430 volts or below 215 volts, this fault will set. This fault should never be set without a related BPM DTC being set.

FAILURE ACTION

This DTC will be logged, the SERVICE SOON telltale will be turned on, and the and the heat pump will be disabled.

RELATED DTCS

BPM 221, 222

TELLTALE ILLUMINATED :

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 31

COMPRESSOR MOTOR CONTROL (CMC) INPUT VOLTAGE OUT OF RANGE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Are any other DTCs set? — Yes → Diagnose other DTCs first.

No

Clear HTCM DTCs, then cycle vehicle Off and back On. Did DTC reset? — No → Condition is intermittent refer to Diagnostic aids.

Yes

CAUTION: REFER,TO PEB REMOVAL PROCEDURE IN PROPULSION SERVICE MANUAL. REMOVE PEB. MEASURE RESISTANCE BETWEEN APM TO PLM CONNECTOR PIN A2 AND PIM TO BATTERY CONNECTOR PIN B. MEASURE RESISTANCE BETWEEN APM TO PIM CONNECTOR PIN AI AND PLM TO BATTERY CONNECTOR PIN E.

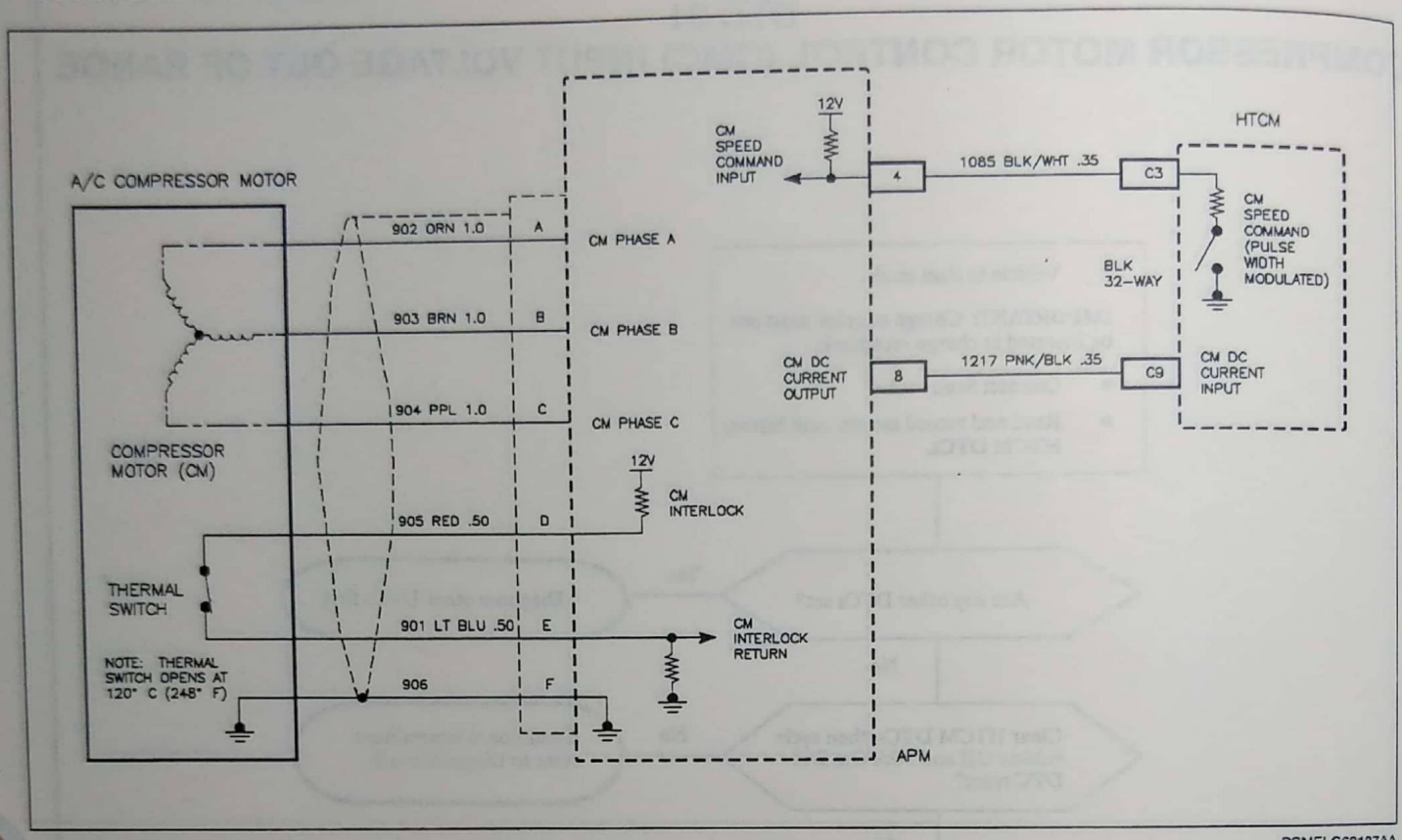
Are both resistance readings below 1.0 ohms? — No → Replace PIM.

Yes

Replace APM.

CamScanner

DTC 32 - COMPRESSOR MOTOR CONTROL (CMC) OVERTE MP OR INTERLOCK FAULT



PSMELC68187AA

COMPRESSOR MOTOR CONTROL (CMC) OVERTEMP OR INTERLOCK FAULT

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The CMC includes an interlock circuit and an over—temperature switch. If the compressor temperature exceeds TBD, the over-temperature switch will open. If this occurs, or if any portion of the interlock circuit opens, the accessory power module (APM) will report that the interlock is open, and the compressor will be shut down.

DTC PARAMETERS

DTC 32 will set if:

- Open compressor circuit.
- Compressor over—temperature.

CMC circuitry problem inadequate output voltage (less than 12 volts) to the interlock loop.

DTC 32 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects an open interlock circuit, this fault will set.

FAILURE ACTION

This DTC will be logged, the SERVICE SOON telltale will be turned On, and the and the heat pump will be disabled.

RELATED DTCS

None

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value chang es or the DTC sets.

Try running compressor for some time to duplicate DTC.

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DTC 32

COMPRESSOR MOTOR CONTROL (CMC) OVERTEMP OR INTERLOCK FAULT

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Clear HTCM DTCs, then cycle vehicle Off and back On. Cycle V f ^"d. .on is intermittent, compressor On and Off. Did /k Refer to Diagnostic a.ds. DTC reset?

No

Yes

CAUTION: REFER TO "HIGH VOLTAGE DISABLE" IN THIS MANUAL AND DISABLE THE HIGH VOLTAGE. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR JUMPER. MAKE SURE 15 MINUTES HAS PASSED SINCE LAST COMPRESSOR CYCLE. MEASURE RESISTANCE ON THE INTERLOCK LOOP.

Is the resistance less than 1.5 ohms?

No → Replace compressor.

Yes

Check resistance of each phase - is resistance between .8 and 2.0 ohms?

No → Replace compressor.

Yes

Run through System Performance Test in this manual - is system ok based on this test?

No → Perform repairs recommended by the system performance test.

Yes

Replace accessory powe module (APM).

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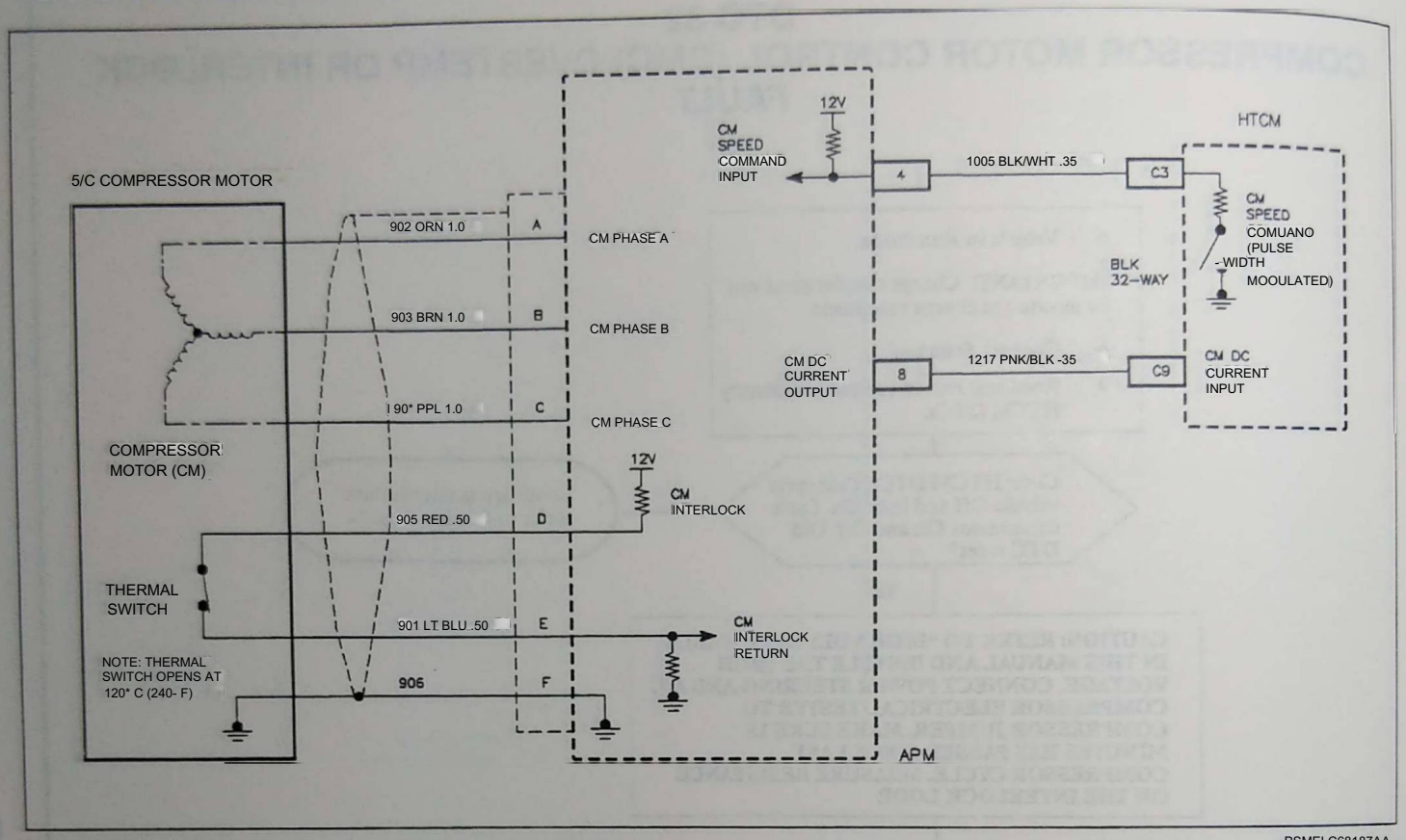
DTC 33 - COMPRESSOR MOTOR CONTROL (CMC) PULSE WIDTH MODULATED (PWM) SIGNAL OUT OF RANGE



PSMELC68187AA

COMPRESSOR MOTOR CONTROL (CMC) PULSE WIDTH MODULATED (PWM) SIGNAL OUT OF RANGE

The accessory power module (APM) provides compressor motor controller (CMC) feedback current to the HPVS/thermal control module (HTCM) via a 12 volt pulse width modulated (PWM) signal. This signal represents the amperage of high voltage current that the compressor is drawing. If the circuit becomes open or shorted, this fault will be reported.

DTC PARAMETERS

DTC 33 will set if:

- PWM circuit open or short to ground or voltage.
- APM failure.
- HTCM failure.

DTC 33 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC feedback signal becomes less than 5% or greater than 95%, this fault will set. This fault will not be set if an HTCM DTC 27 (APM shutdown) or 43 (automatic disconnect open) is active.

FAILURE ACTION

This DTC will be logged, and the heat pump will be disabled.

RELATED DTCS

HTCM 27, 43, 65.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

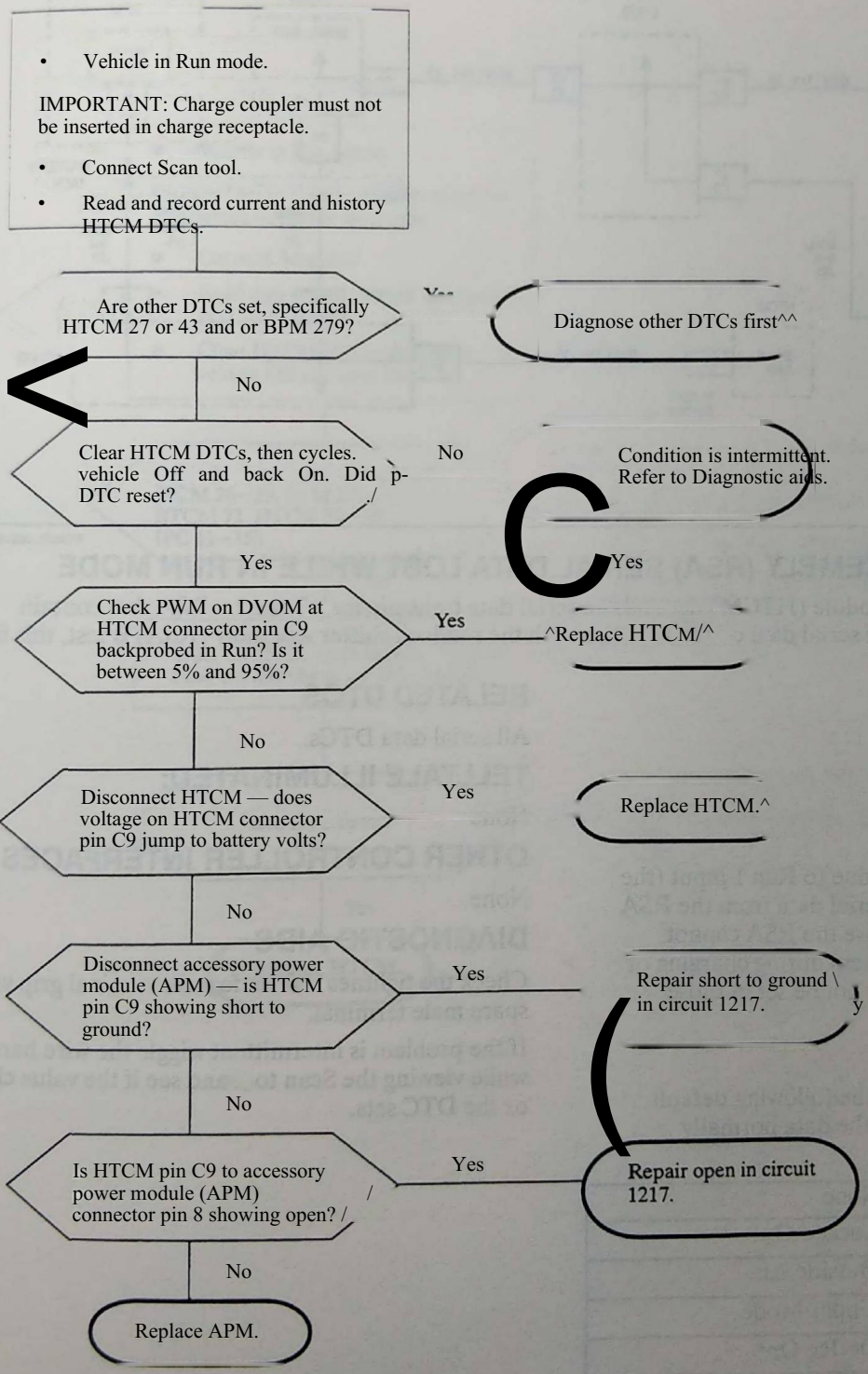
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

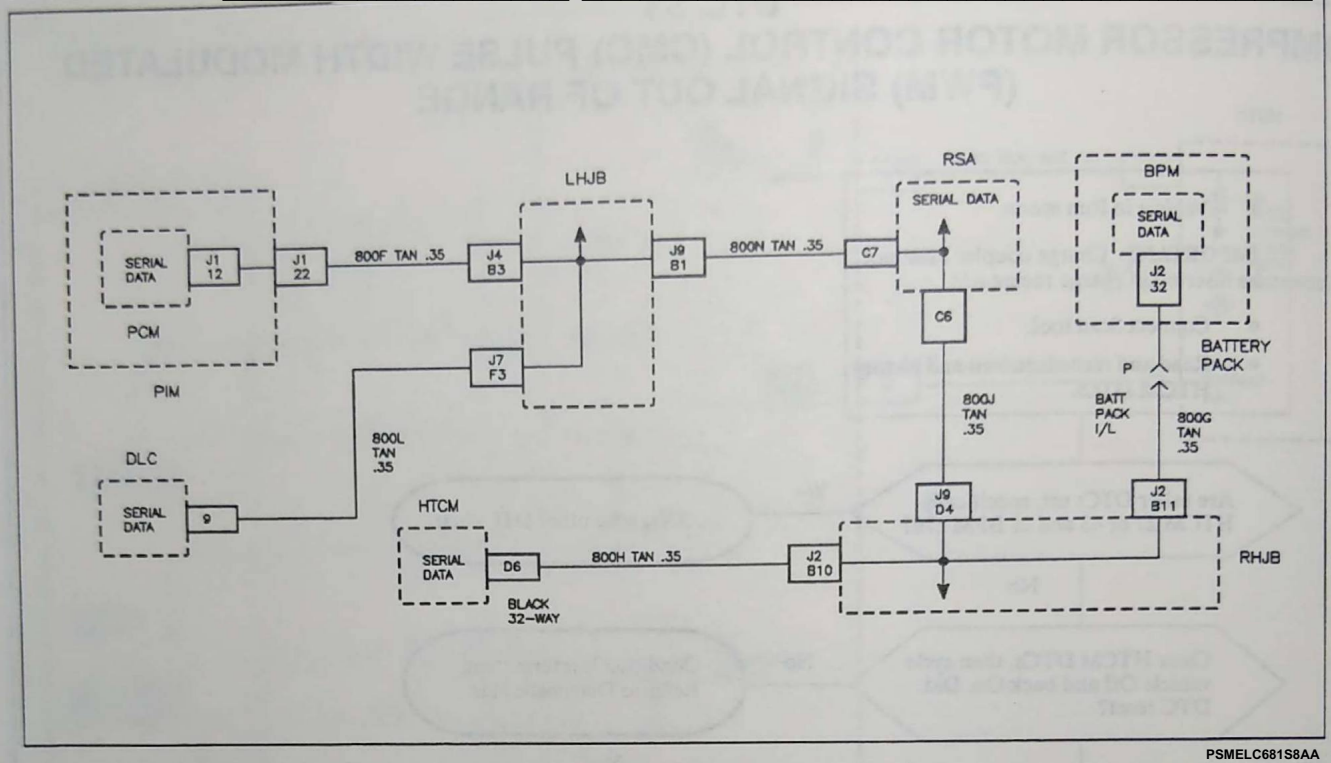
If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value chang or the DTC sets.

CamScanner

DTC 33
COMPRESSOR MOTOR CONTROL (CMC) PULSE WIDTH MODULATED (PWM) SIGNAL OUT OF RANGE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Are other DTCs set, specifically HTCM 27 or 43 and or BPM 279?
Diagnose other DTCs first^^
No
Clear HTCM DTCs, then cycles. vehicle Off and back On. Did p-DTC reset?
No
Condition is intermittent. Refer to Diagnostic aids.
Yes
Yes
Check PWM on DVOM at HTCM connector pin C9 backprobed in Run? Is it between 5% and 95%?
Yes
^Replace HTCM/^
No
Disconnect HTCM — does voltage on HTCM connector pin C9 jump to battery volts?
Yes
Replace HTCM.^
No
Disconnect accessory power module (APM) — is HTCM pin C9 showing short to ground?
Yes
Repair short to ground in circuit 1217.
No
Is HTCM pin C9 to accessory power module (APM) connector pin 8 showing open?
Yes
Repair open in circuit 1217.
No
Replace APM.

DTC 34 - RUN/LOCK SHIFT ASSEMBLY (RSA) SERIAL DATA LOST WHILE IN RUN MODE



PSMELC681S8AA

RUN/LOCK SHIFT ASSEMBLY (RSA) SERIAL DATA LOST WHILE IN RUN MODE

The HPVS/thermal control module (HTCM) depends on serial data transmissions from the RSA that contain climate control information. If serial data communication with the run/lock shifter assembly (RSA) is lost, this fault will be set.

DTC PARAMETERS

DTC 34 will set if:

- Serial data circuit open.
- Failed RSA.

DTC 34 will set when:

Anytime the HTCM is awake due to Run 1 input (the vehicle is in Run mode) and serial data from the RSA is lost, this fault will set. Because the RSA cannot control the climate control system during charging or preconditioning, this DTC will not be set in those conditions.

FAILURE ACTION

This DTC will be logged, and the following default values will be used in place of the data normally received from the RSA.

Preconditioning Request	None
Time Set Enable/Display	Locked Out
Cabin Air Source	Outside Air
Mode Door Position	Upper Mode
Front Glass Request	De-Ice On*
Back Glass Defogger	Off
Heat Pump	Vem
Cabin Blower	Lowest Speed

* Depending on ambient temperature, the windshield may become hot.

RELATED DTCS

All serial data DTCs.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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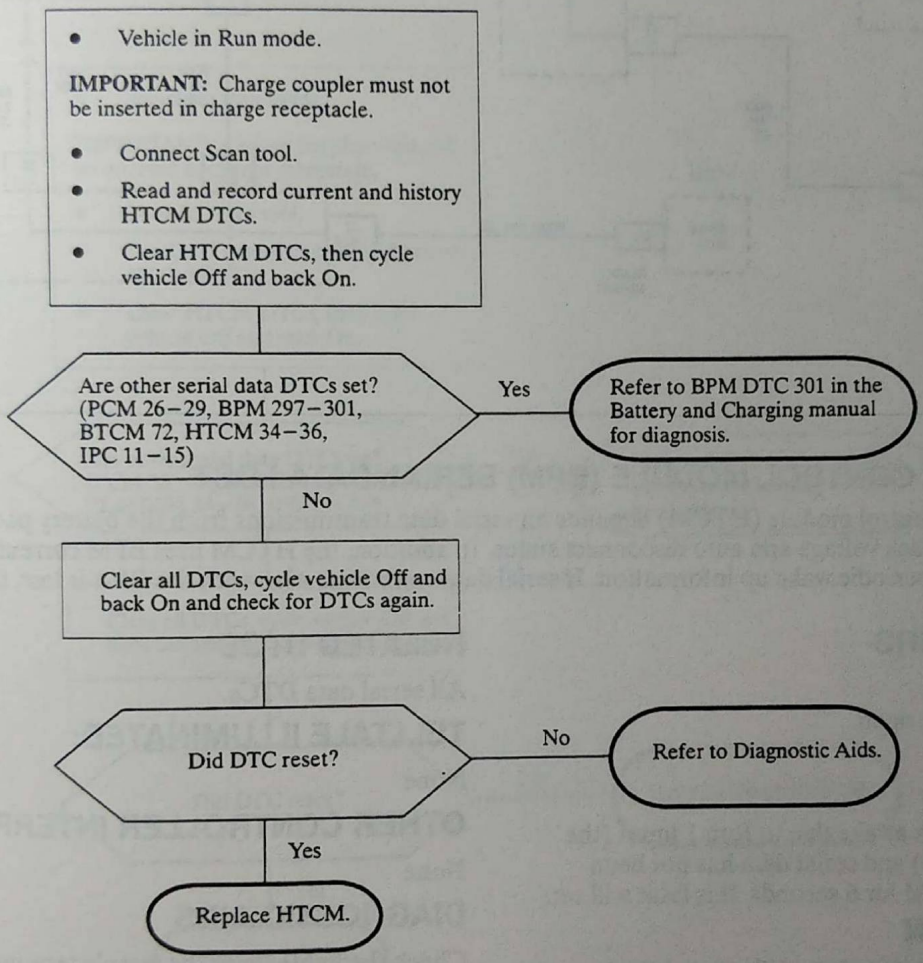
DTC 34
PUN LOCK SHIFT ASSEMBLY (RSA) SERIAL DATA LOST WHILE IN RUN MODE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
• Clear HTCM DTCs, then cycle vehicle Off and back On.
Are other serial data DTCs set? (PCM 26–29, BPM 297–301, BTCM 72, HTCM 34–36, IPC 11–15)
Yes
Refer to BPM DTC 301 in the Battery and Charging manual for diagnosis.
No
Clear all DTCs, cycle vehicle Off and back On and check for DTCs again.
Did DTC reset?
No
Refer to Diagnostic Aids.
Yes
Replace HTCM.

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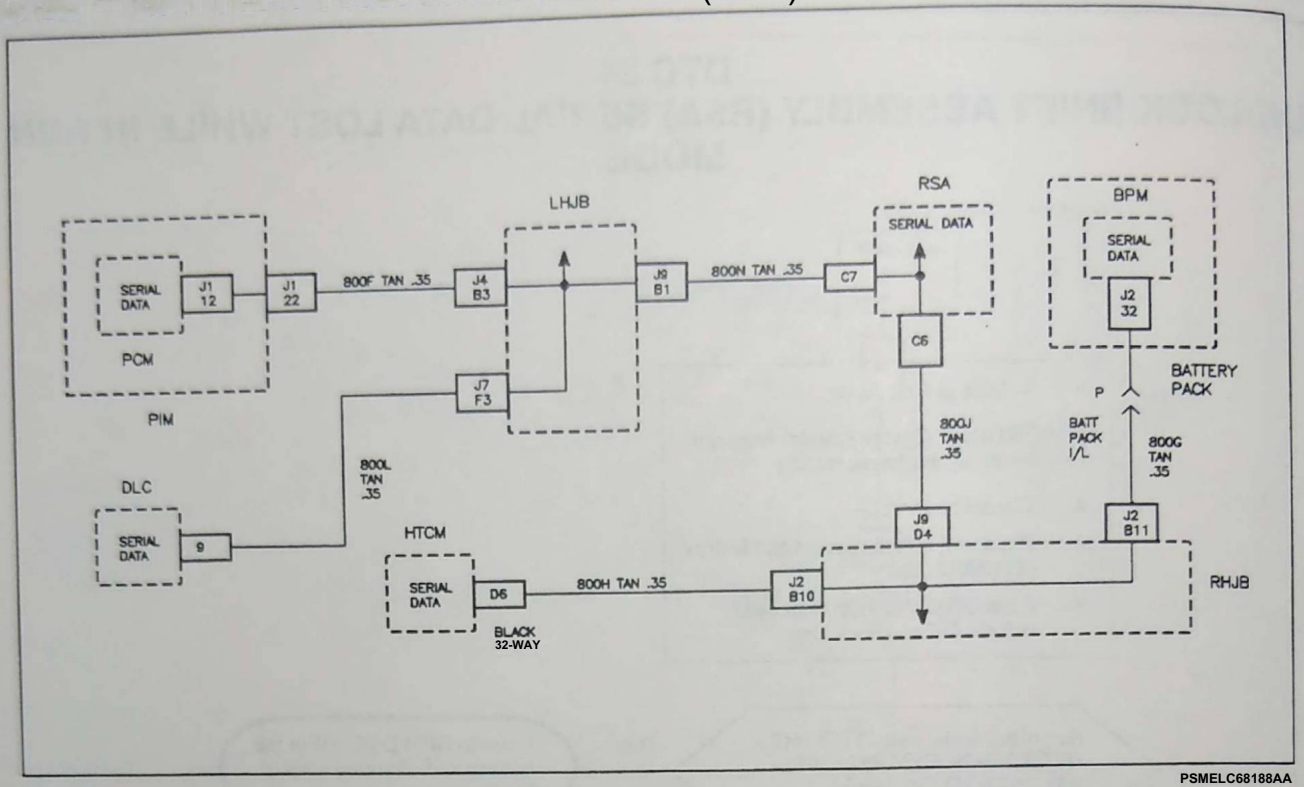
~DTC 36 - BATTERY PACK CONTROL MODULE (BPM) SERIAL DATA LOST



BATTERY PACK CONTROL MODULE (BPM) SERIAL DATA LOST

The HPVS/thermal control module (HTCM) depends on serial data transmissions from the battery pack module (BPM) that contain pack voltage and auto disconnect status. In addition, the HTCM uses BPM current, charge port cooling request, and periodic wake up information. If serial data communication with the RSA is lost, this fault will be set.

DTC PARAMETERS

DTC 36 will set if:

- Serial data circuit open.
- Failed BPM.

DTC 36 will set when:

Anytime the HTCM is awake due to Run 1 input (the vehicle is in run mode) and serial data has not been received from the BPM for 6 seconds, this fault will set.

FAILURE ACTION

This DTC will be logged, and the following default values will be used in place of the data normally received from the BPM.

Pack Voltage	None
Pack Voltage Faults	DTC 044 present
Auto Disconnect Status	DTC 043 present
Current Available	No (locks out preconditioning)
Charge Port Cool Request	Wake Up*
BPM Periodic Wake Up	No (locks out periodic wake up)

♦ The HTCM will enter charge mode if the BPM is commanding vehicle wake up.

RELATED DTCS

All serial data DTCs.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

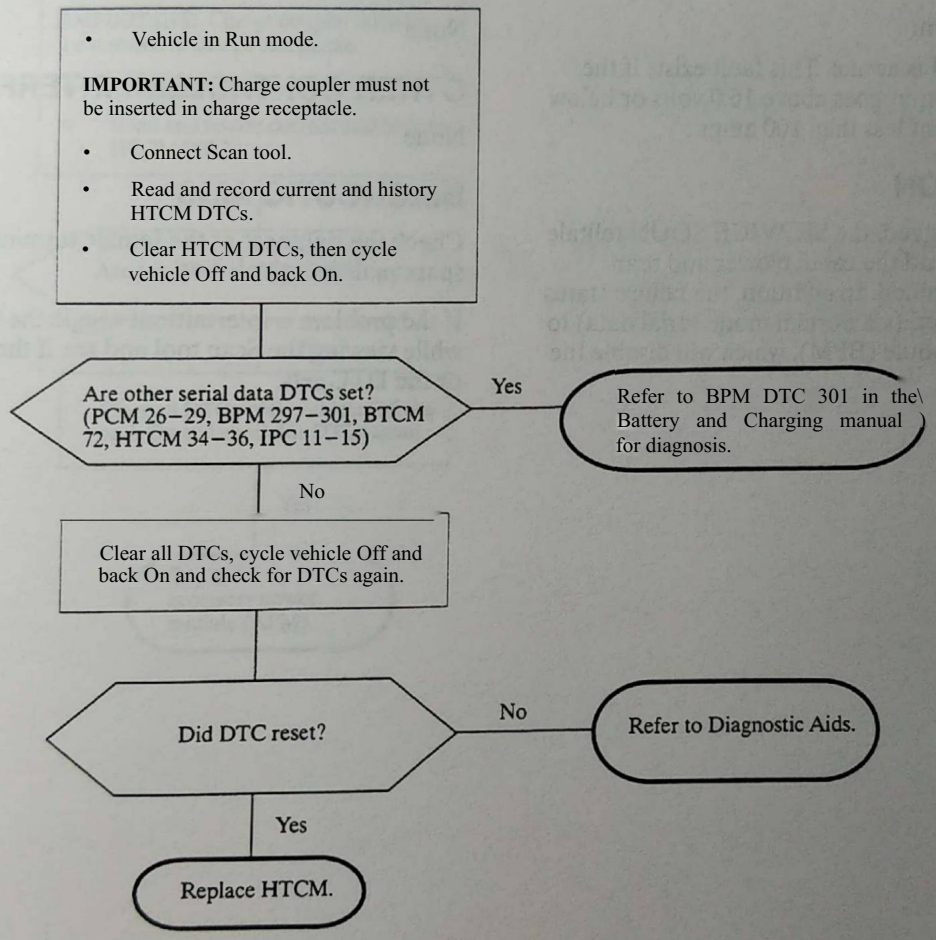
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 36
BATTERY PACK CONTROL MODULE (BPM) SERIAL DATA LOST


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
• Clear HTCM DTCs, then cycle vehicle Off and back On.
Are other serial data DTCs set? (PCM 26–29, BPM 297–301, BTCM 72, HTCM 34–36, IPC 11–15)
Yes
Refer to BPM DTC 301 in the\ Battery and Charging manual for diagnosis.
No
Clear all DTCs, cycle vehicle Off and back On and check for DTCs again.
Did DTC reset?
No
Refer to Diagnostic Aids.
Yes
Replace HTCM.

CamScanner

DTC 37 - ACCESSORY POWER MODULE (APM) 12 VOLT OUT OF RANGE MAJOR

Because the accessory power J '(A) ,i. (APMi does not communicate on the serial data line, it does not store trouble The HPVS/thermal control modu[i]e (HTCM) serves as an interface to the APM by storing d,agTpM urS^nosti trouble DTCs and providing status information over serial data. APM status is several APMI redated g■ discrete digitalinterface wires. The APM indicates status and fault conditions m nicated to the HTCM via six S' d™ng th«e lines high or low If the APM 12 volt regulated output goes extremely out of range, this DTC will be set.

DTC PARAMETERS

DTC 37 will set if:

APM fault.

DTC 37 will set when:

Anytime the HTCM is awake. This fault exists if the 12 volt regulated output goes above 16.0 volts or below 10.5 volts with current less than 100 amps..

FAILURE ACTION

This DTC will be logged, the SERVICE SOON telltale will be turned On. and the cabin blower and rear defogger will be disabled. In addition, the failure status will be communicated (via normal mode serial data) to the battery pack module (BPM), which will disable the battery pack fan.

RELATED DTCS

BPM 310, 311, PCM 59, 60, 104.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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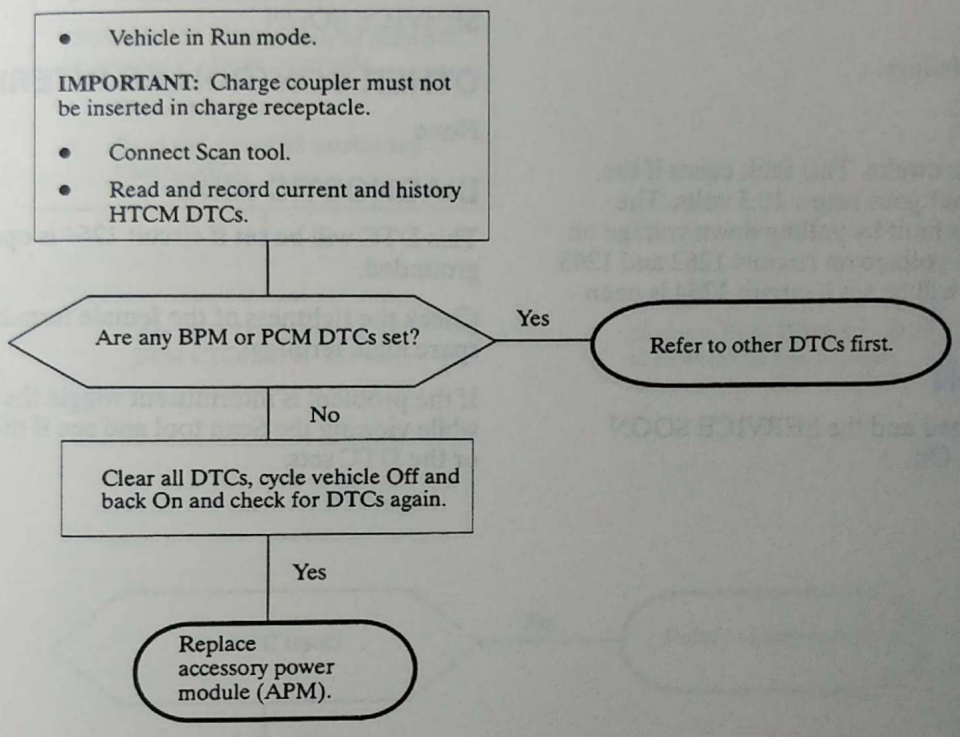
DTC 37
ACCESSORY POWER MODULE (APM) 12 VOLT OUT OF RANGE MAJOR


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record current and history HTCM DTCs.
Are any BPM or PCM DTCs set?
Yes
Refer to other DTCs first.
No
Clear all DTCs, cycle vehicle Off and back On and check for DTCs again.
Yes
Replace accessory power module (APM).

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DTC 38 - ACCESSORY POWER MODULE (APM) LOW AUXILIARY BATTERy

Because the accessory power module does not communicate on the serial data line it does not store diagnostic trouble DTCs The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. If the APM voltage is determined to be below 10.5 volts, this DTC will be set.

DTC PARAMETERS

DTC 38 will set if:

- Circuit 1264 open or grounded.
- APM fault.
- Auxiliary- battery failure.

DTC 38 will set when:

Anytime the HTCM is awake. This fault exists if the 12 volt regulated output goes below 10.5 volts. The APM will indicate this fault by pulling down voltage on circuit 1264. while the voltage on circuits 1262 and 1263 stays high. This DTC will be set if circuit 1264 is open or grounded.

FAILURE ACTION

This DTC will be logged and the SERVICE SOON telltale will be turned On.

RELATED DTCS

HTCM 65, PCM 59, PCM 104, BPM 282, BPM 311

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

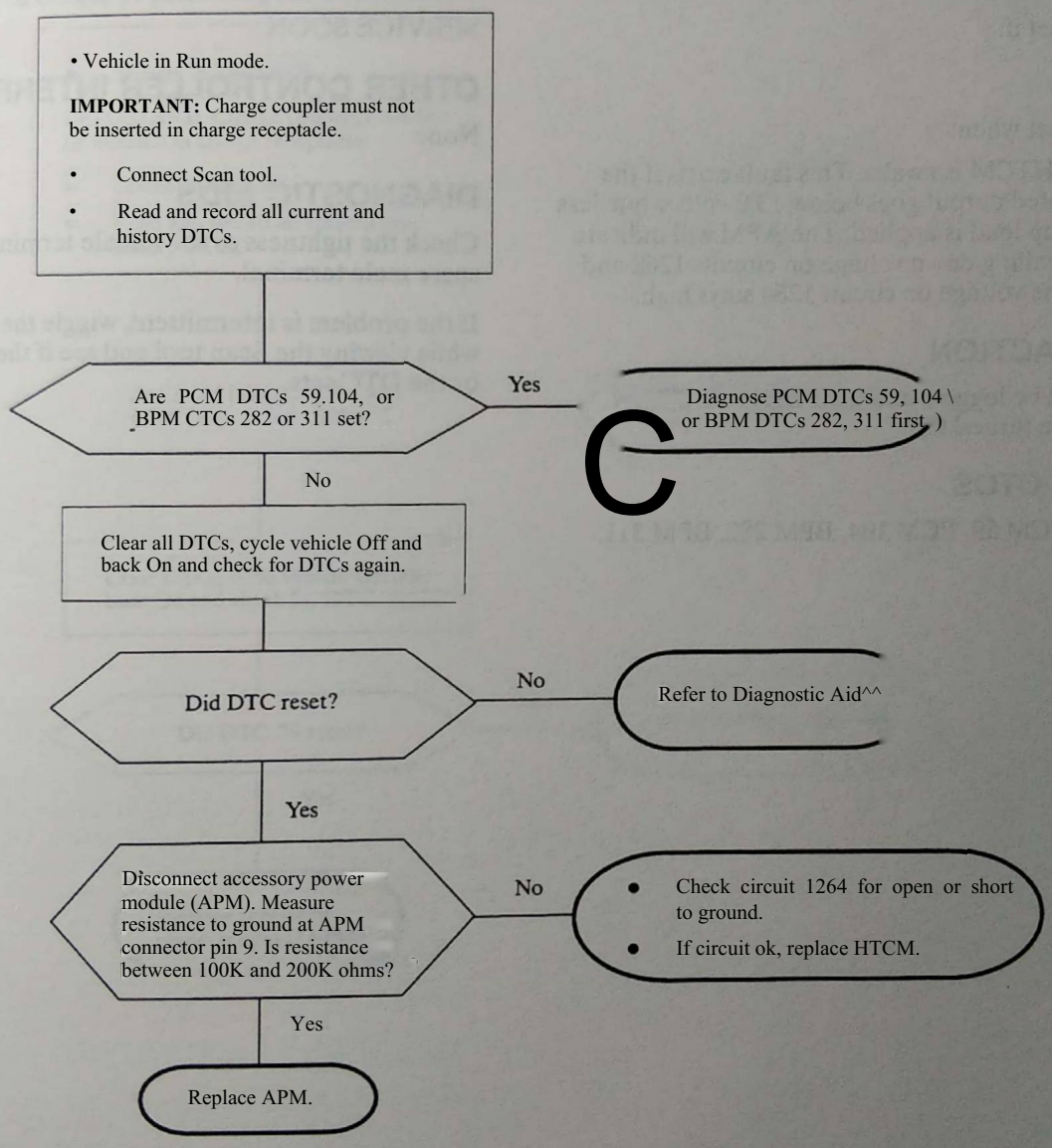
This DTC will be set if circuit 1264 is open or grounded.

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 38
ACCESSORY POWER MODULE (APM) 12 VOLT OUT OF RANGE MAJOR


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are PCM DTCs 59.104, or BPM CTCs 282 or 311 set?
Yes
Diagnose PCM DTCs 59, 104 \ or BPM DTCs 282, 311 first.)
C
No
Clear all DTCs, cycle vehicle Off and back On and check for DTCs again.
Did DTC reset?
No
Refer to Diagnostic Aid^^
Yes
Disconnect accessory power module (APM). Measure resistance to ground at APM connector pin 9. Is resistance between 100K and 200K ohms?
No
• Check circuit 1264 for open or short to ground.
• If circuit ok, replace HTCM.
Yes
Replace APM.

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DTC 39 - ACCESSORY POWER MODULE (APM) 12 VOLT OUT OF RANGE MINOR

Because the accessory power module (APM) does not communicate on the serial data line, it does not store DTCs. Th^HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related DTCs and providing status information over serial data. APM status is communicated to the I FT CM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. If the APM 12 volt regulated output goes out of range, this DI C will be set.

DTC PARAMETERS

DTC 39 will set if:

APM fault.

DTC 39 will set when:

Anytime the HTCM is awake. This fault exists if the 12 volt regulated output goes below 13.0 volts while less than a 100 amp load is applied. The APM will indicate this fault by pulling down voltage on circuits 1262 and 1263, while the voltage on circuit 1264 stays high.

FAILURE ACTION

This DTC tiD be logged, and the SERVICE SOON telltale will be turned On.

RELATED DTCS

HTCM 40, PCM 59, PCM 104, BPM 282, BPM 311.

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

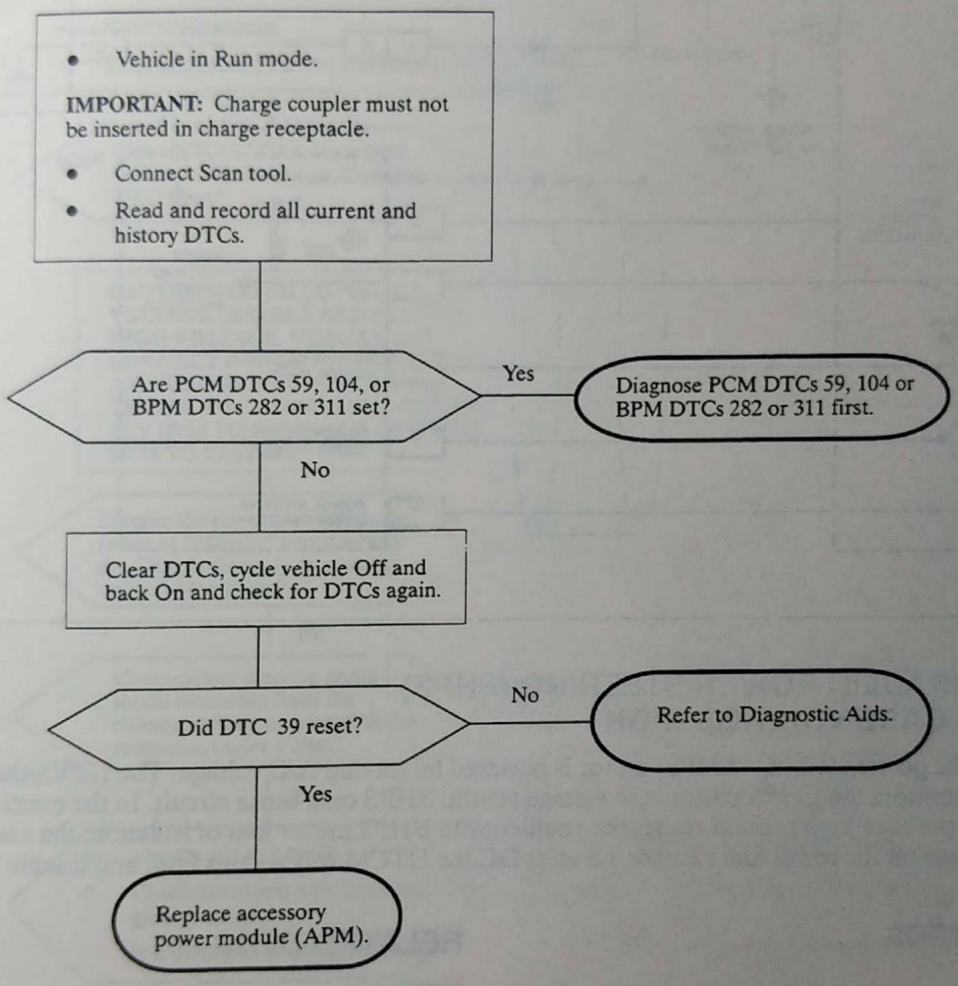
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

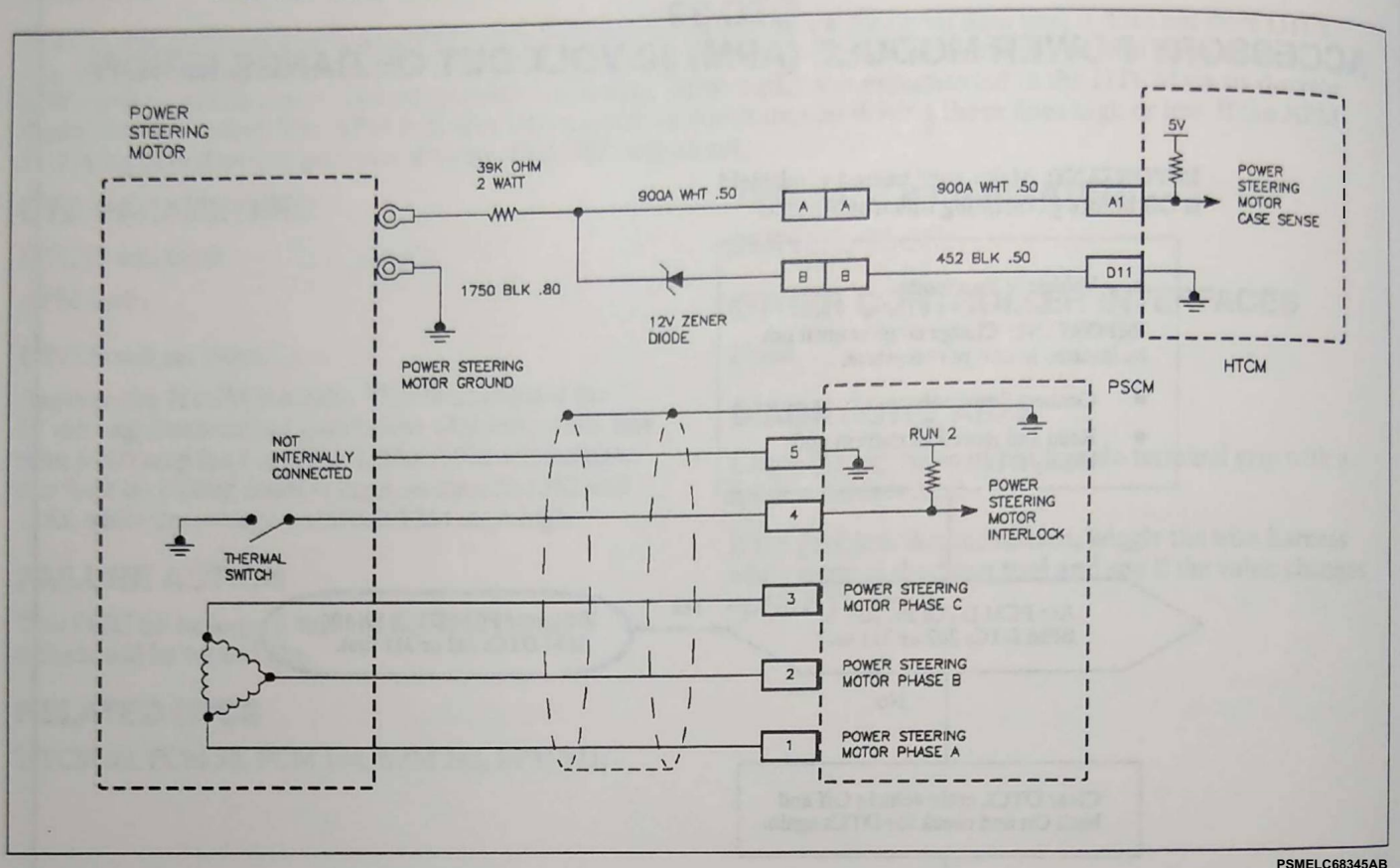
DTC 39
ACCESSORY POWER MODULE (APM) 12 VOLT OUT OF RANGE MINOR

IMPORTANT Make sure heated windshield is Off before performing this trouble tree.


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are PCM DTCs 59, 104, or BPM DTCs 282 or 311 set?
Yes
Diagnose PCM DTCs 59, 104 or BPM DTCs 282 or 311 first.
No
Clear DTCs, cycle vehicle Off and back On and check for DTCs again.
Did DTC 39 reset?
No
Refer to Diagnostic Aids.
Yes
Replace accessory power module (APM).

CamScanner

DTC 40 - ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP MOTOR CASE VOLTAGE HIGH



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ELECTRO-HYDRAULIC POWER STEERING (EHPS) PUMP MOTOR CASE VOLTAGE HIGH

The electro-hydraulic power steering (EHPS) motor is powered by varying A/C voltage. The HPVS/thermal control module (HTCM) monitors the EHPS motor case voltage via the EHPS case sense circuit. In the event of the loss of both EHPS ground paths or high ground resistance coupled with EHPS motor loss of isolation, the case voltage will rise. When the voltage on the sense line exceeds 1.5 volts DC the HTCM will set this fault and disable the compressor.

DTC PARAMETERS

DTC 40 will set if:

- Circuit 900A open.
- Ground sensing harness assembly fault.
- Total loss of EHPS motor ground
- Partial Loss of EHPS motor ground, combined with loss of EHPS motor isolation.
- HTCM fault.

DTC 40 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects voltage greater than 1.5 volts DC at the EHPS motor case sense input.

FAILURE ACTION

This DTC will be logged, the EHPS motor may be disabled, and the SERVICE SOON telltale will be turned On.

RELATED DTCS

None

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

If the problem is not resolved by using the trouble tree, try spraying the power steering pump ground sensing harness, and connectors with salt water, then step through the trouble tree again.

Check the tightness of the female terminal grip with 3 spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value cha & nges or the DTC sets.

CamScanner

DTC 40
ELECTRO-HYDRAULIC POWER STEERING (EHPS)
PUMP MOTOR CASE VOLTAGE HIGH

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record current and history HTCM DTCs.

Clear HTCM DTCs, then cycle vehicle off and back on. Does the DTC reset?

No → Problem is intermittent; refer to diagnostic aids.

Yes

CAUTION: REFER TO "HIGH VOLTAGE DISABLE AND DISABLE HIGH VOLTAGE. VEHICLE OFF. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DVM TO OHMS AND CONNECT DVM TO TESTER.

Megger the power steering pump (refer to "Megger" procedure in the Chassis manual). Is reading under 5 Meg ohms?

Yes → Replace power steering pump.

No

Check power steering ground shield resistance from the connector body to ground. Is the resistance under 1 ohm?

No → Replace power steering pump.

Yes

- Vehicle in Lock mode.
- Check the power steering pump ground cable.

Is it damaged or disconnected?

Yes → Reconnect or replace ground A cable.

No

Disconnect harness jumper. Select Run mode. Is voltage at harness side of jumper pin a over 4.5 volts?

No →
- Check for open in circuit 900A from jumper pin A to HTCM pin A1.
- If circuit ok, replace HTCM.

Yes

Is resistance from jumper harness pin A to power steering case between 35K and 45K ohms?

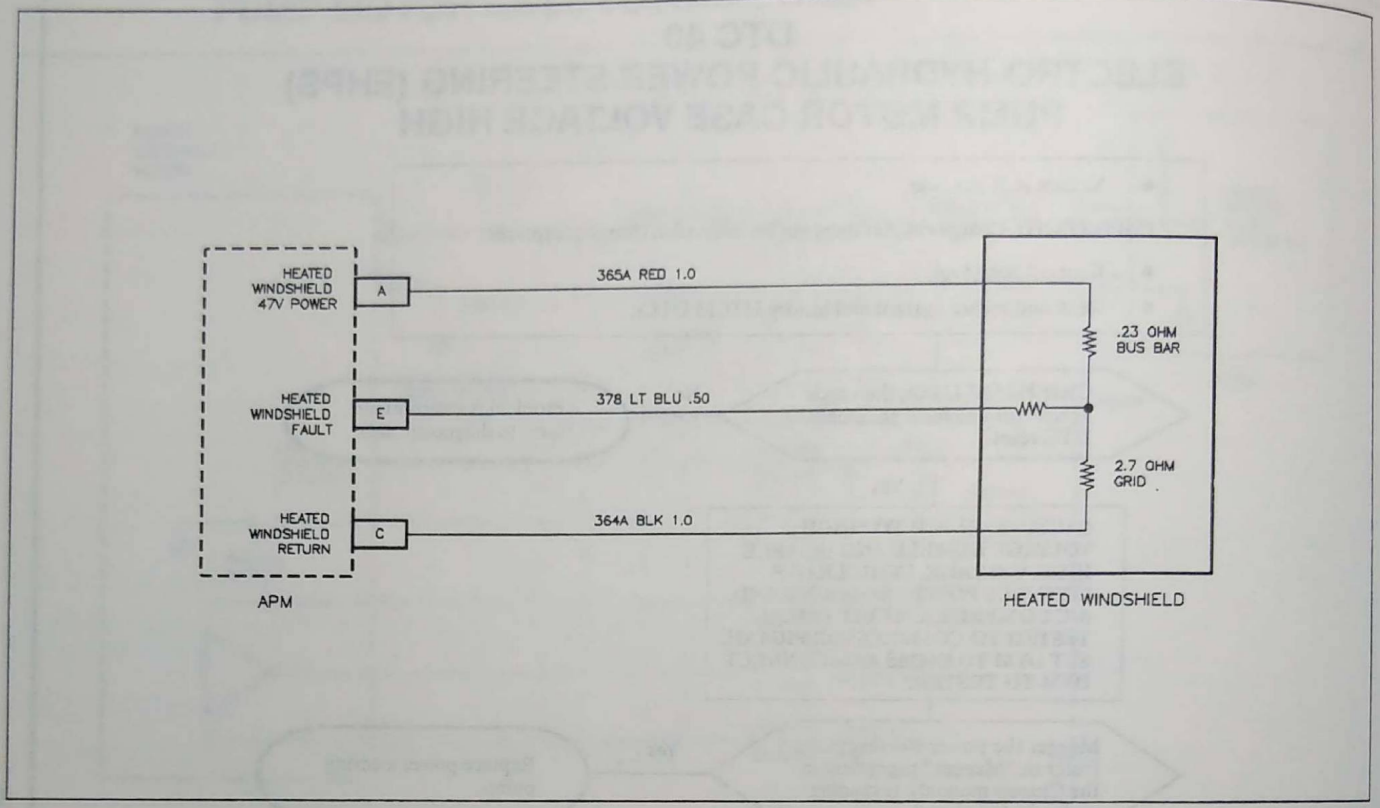
No → Replace jumper harness.

Yes

Check all connections. If no trouble found, refer to diagnostic aids.

CamScanner

DTC 41 - ACCESSORY POWER MODULE (APM) 47 VOLT ISOLATION



PSMELC68344AA

ACCESSORY POWER MODULE (APM) 47 VOLT ISOLATION

Because the accessory power module (APM) does not communicate on the serial data line, it does not store DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. If the APM detects the resistance from +47V (ckt 365A) or -47V (circuit 364A) to ground is less than 100K when turned on, this fault will be set.

DTC PARAMETERS

DTC 41 will set if:

- Pigtail solder joint to windshield not sealed properly.
- Windshield pigtail problem.
- Windshield is out of spec.
- Sputtercoating providing ground path through urethane
- APM fault.

DTC 41 will set when:

Anytime the HTCM is awake and windshield has been turned On. This fault exists if the APM detects the resistance from +47V power to ground is less than 100K at 50V.

FAILURE ACTION

This DTC will be logged, the SERVICE SOON telltale will be turned On, and the APM reduces the 47V output to 42V when activated (windshield clearing will take longer).

RELATED DTCS

HTCM 21

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

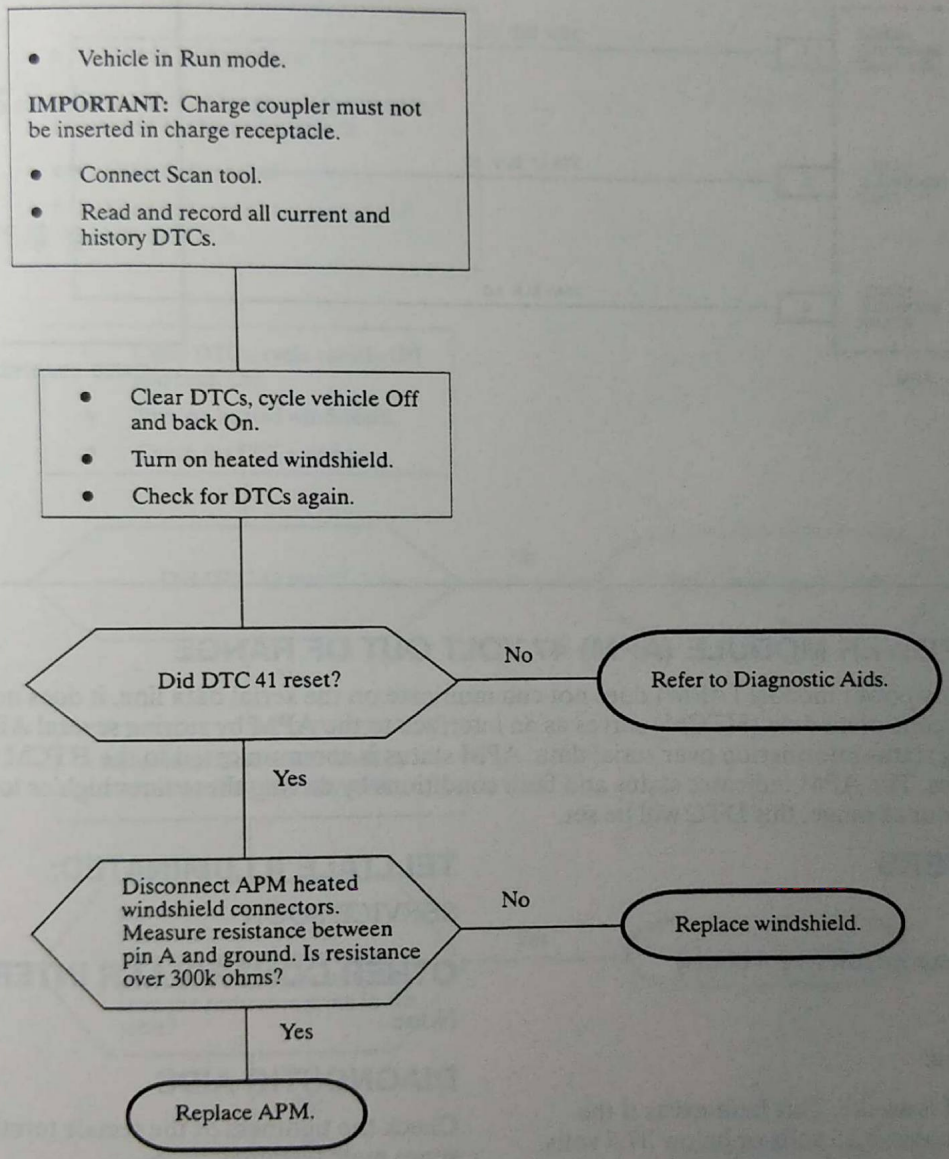
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

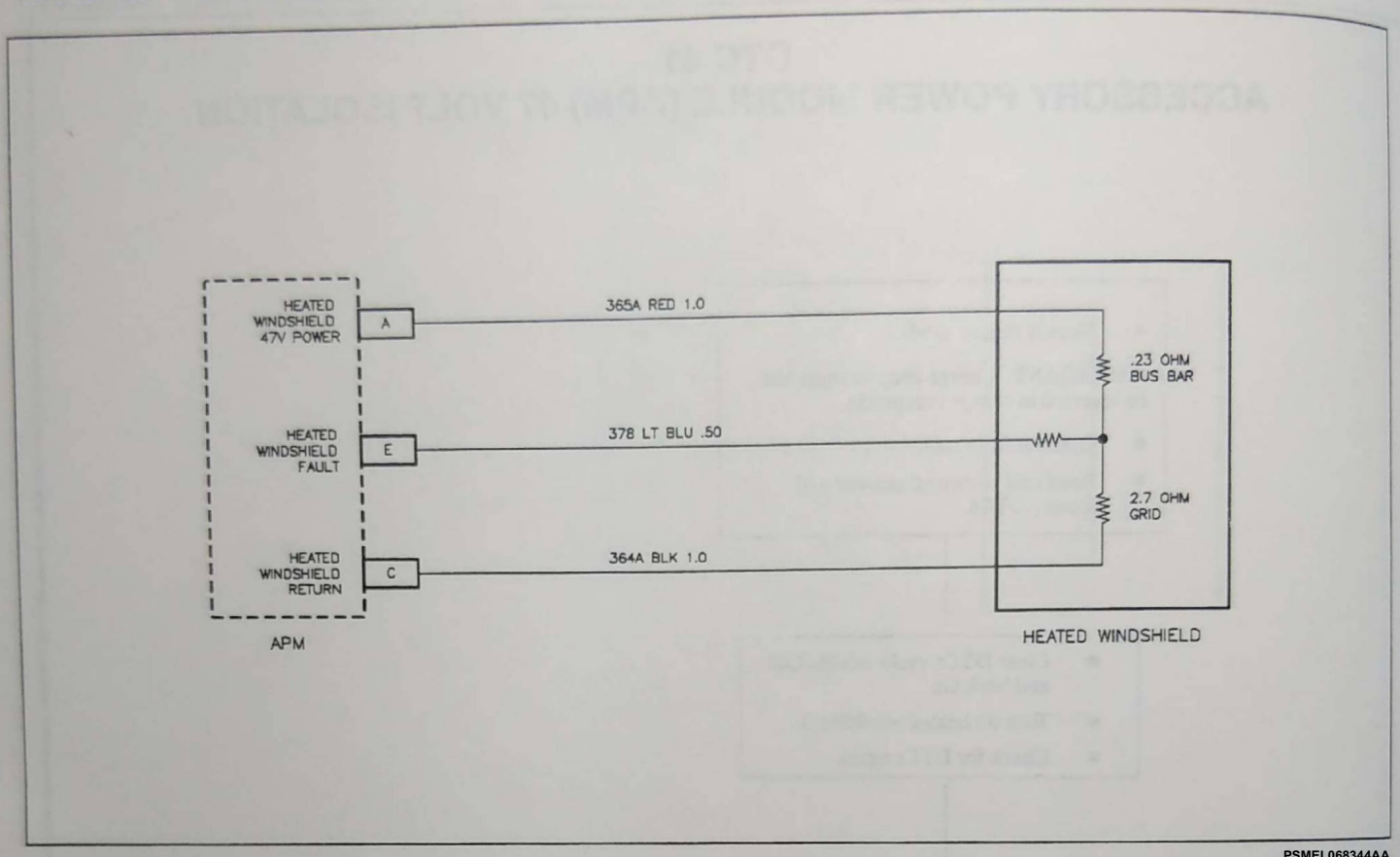
CamScanner

DTC 41
ACCESSORY POWER MODULE (APM) 47 VOLT ISOLATION


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
• Clear DTCs, cycle vehicle Off and back On.
• Turn on heated windshield.
• Check for DTCs again.
Did DTC 41 reset?
No
Refer to Diagnostic Aids.
Yes
Disconnect APM heated windshield connectors. Measure resistance between pin A and ground. Is resistance over 300k ohms?
No
Replace windshield.
Yes
Replace APM.

CamScanner

DTC 42 - ACCESSORY POWER MODULE (APM) 47 VOLT OUT OF RANGE



PSMEL068344AA

ACCESSORY POWER MODULE (APM) 47 VOLT OUT OF RANGE

Because the accessory power module (APM) does not communicate on the serial data line, it does not store DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. If the APM 47 volt output goes out of range, this DTC will be set.

DTC PARAMETERS

DTC 42 will set if:

- Windshield resistance low (<2.4 ohms)
- APM fault.

DTC 42 will set when:

Anytime the HTCM is awake. This fault exists if the 47 volt output goes above 63.5 volts or below 37.5 volts.

FAILURE ACTION

This DTC will be logged, and the SERVICE SOON telltale will be turned On.

RELATED DTCS

None

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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DTC 42
ACCESSORY POWER MODULE (APM) 47 VOLT OUT OF RANGE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history DTCs.

- Clear DTCs, cycle vehicle Off and back On.
- Turn on heated windshield.
- Check for DTCs again.

Did DTC 42 reset?

No → Refer to Diagnostic Aids.

Yes

Important Zero meter leads or inaccurate diagnosis may occur.

Disconnect APM heated windshield connectors.

yes → A Replace windshield.

Measure resistance between pin A and C. Is resistance less than the resistance given in the table?

No → Replace APM?

Resistance	Ambient Temp C- (F')
2.4	0(32)
2.7	25(77)
3.0	50 (122)

CamScanner

DTC 43 - AUTOMATIC DISCONNECT OPEN

The HPVS/thermal control module (HTCM) constantly monitors the serial data line to receive information from and about other controllers set. If the BPM indicates (via serial data) that the auto disconnect is open, this DTC win be set.

DTC PARAMETERS

DTC 43 will set if:

The automatic disconnect is open.

DTC 43 will set when:

Anytime the HTCM is awake. This condition exists if the BPM indicates auto disconnect open over serial data.

FAILURE ACTION

This DTC will be logged. In addition, the HTCM de-asserts vehicle wake-up and disables both the cabin blower and the rear defogger. Also, fault diagnosis requiring APM inputs are disabled. Finally, the system will default to VENT mode and will remain in VENT mode until selected otherwise by the passenger from the run/lock shift assembly (RSA). The RSA LEDs will change to VENT mode.

RELATED DTCS

BPM 272 through BPM 280.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

BPM DTCs should always accompany this DTC. If it is current to the “BPM DTCs” for diagnosis.

CamScanner

DTC 43
AUTOMATIC DISCONNECT OPEN

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history DTCs.
- Refer to “BPM DTCs” for diagnosis.

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DTC 44 - PACK VOLTAGE FAULT

The HPVS/thermal control module (HTCM) constantly monitors the serial data line to receive information from and about other controllers. If the BPM indicates (via serial data) that there is a pack voltage fault, this DTC will be set.

DTC PARAMETERS

DTC 44 will set if:

Battery pack voltage faults.

DTC 44 will set when:

Anytime the HTCM is awake. This fault exists if the BPM indicates auto disconnect open over serial data.

FAILURE ACTION

This DTC will be logged. In addition, the heat pump is disabled.

RELATED DTCS

BPM module and pack faults.

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

BPM DTCs should always accompany this DTC. Refer to the “BPM DTCs” for diagnosis.

CamScanner

DTC 44
PACK VOLTAGE FAULT

• Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history DTCs.
- Refer to “BPM DTCs” in the “Battery and Charging System” service manual for diagnosis.

CamScanner

DTC 45 - HTCM MEMORY FAILURE

Each time the HPVS/thermal control module (HTCM) is powered up an initialization process tests a value in memory against the same value in EEPROM for a match. If the values do not match, this DTC will be set.

DTC PARAMETERS

DTC 45 will set if:

HTCM memory (EEPROM) failure.

DTC 45 will set when:

Each time the HTCM is awakened. Every time the system is powered up, it performs a self test that compares a value in memory against the same value in EEPROM. If these two values do not match, this DTC will be set.

FAILURE ACTION

This DTC will be logged and the SERVICE SOON telltale will be turned On.

RELATED DTCS

None

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

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DTC 45
HTCM MEMORY FAILURE

- If DTC 45 is set it is due to an internal HTCM fault.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Replace HTCM.

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DTC 46 - ACCESSORY POWER MODULE (APM) OVER TEMPERATURE

Because the accessory power module (APM) does not communicate on the serial data line, it does not store DTCs The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. If the APM's temperature is excessive, this DTC will be set.

DTC PARAMETERS

DTC 46 will set if:

- APM fault.
- Cooling system failure.

DTC 46 will set when:

Anytime the HTCM is awake. This fault exists if the APM determines that it has exceeded its temperature limit.

FAILURE ACTION

This DTC will be logged and the temperature (TEMP) telltale will be turned On. In addition, both the rear defogger and the cabin blower are disabled. Also, the batten' pack module is informed (via serial data) of the APM failure so that it will disable charging and the battery' pack fan. Finally, the following over temperature actions are taken:

- Front end fan (FEF) and coolant pump are forced to high speed (14.5V).
- The coolant valve is forced to the radiator position.
- The heat pump is disabled.
- Preconditioning is disabled.
- Regenerative braking is disabled.

RELATED DTCS

HTCM 47-64 or PCM 34, 36, 37

TELLTALE ILLUMINATED:

Temperature (TEMP)

OTHER CONTROLLER INTERFACES

None

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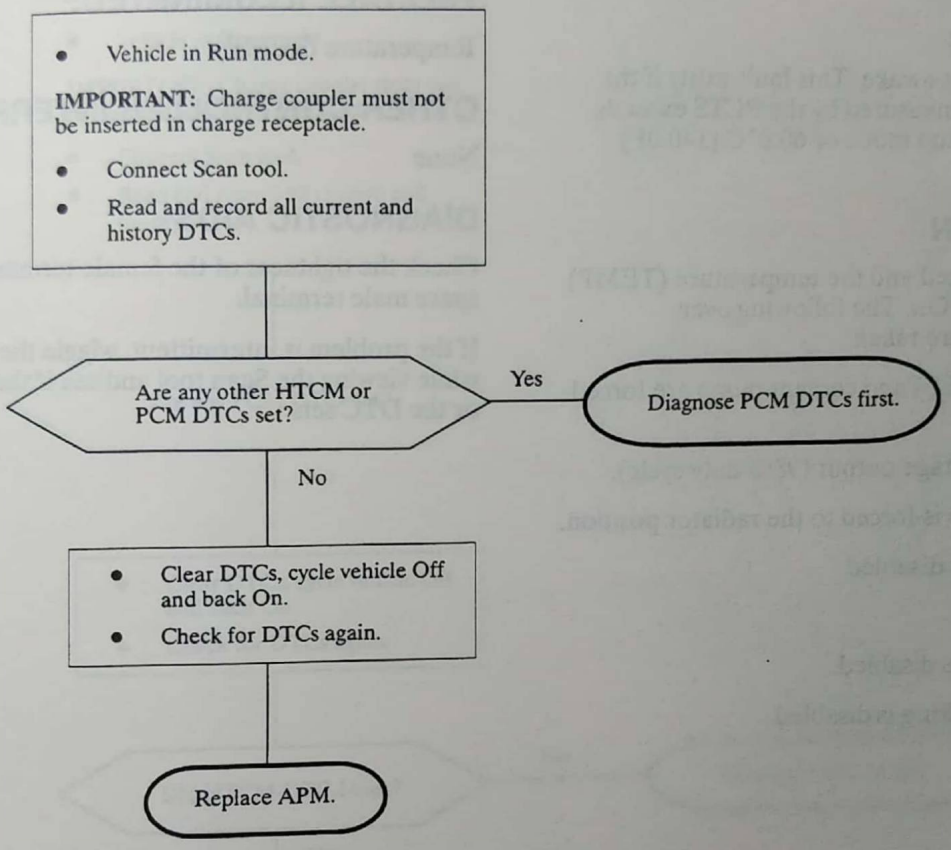
DTC 46
ACCESSORY POWER MODULE (APM) OVER TEMPERATURE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are any other HTCM or PCM DTCs set?
Yes
Diagnose PCM DTCs first.
No
• Clear DTCs, cycle vehicle Off and back On.
• Check for DTCs again.
Replace APM.

CamScanner

DTC 47 - COOLANT OVER TEMPERATURE

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block If the coolant temperature monitored by the pump coolant temperature (PCTS) is excessive, this DTC will be set.

DTC PARAMETERS

DTC 47 will set if:

Cooling system failure.

DTC 47 will set when:

Anytime the HTCM is awake. This fault exists if the coolant temperature measured by the PCTS exceeds 74.0°C (165.2°F) in Run mode or 60.0°C (140.0F) while charging.

FAILURE ACTION

This DTC will be logged and the temperature (TEMP) telltale will be turned On. The following over temperature actions are taken:

- Front end fan (FEF) and coolant pump are forced to high speed.
- (14.5V) APM voltage output (98% duty cycle).
- The coolant valve is forced to the radiator position.
- The heat pump is disabled.
- Charging disable
- Preconditioning is disabled.
- Regenerative braking is disabled.

RELATED DTCS

BPM 296

TELLTALE ILLUMINATED:

Temperature (TEMP)

OTHER CONTROLLER INTERFACES

None

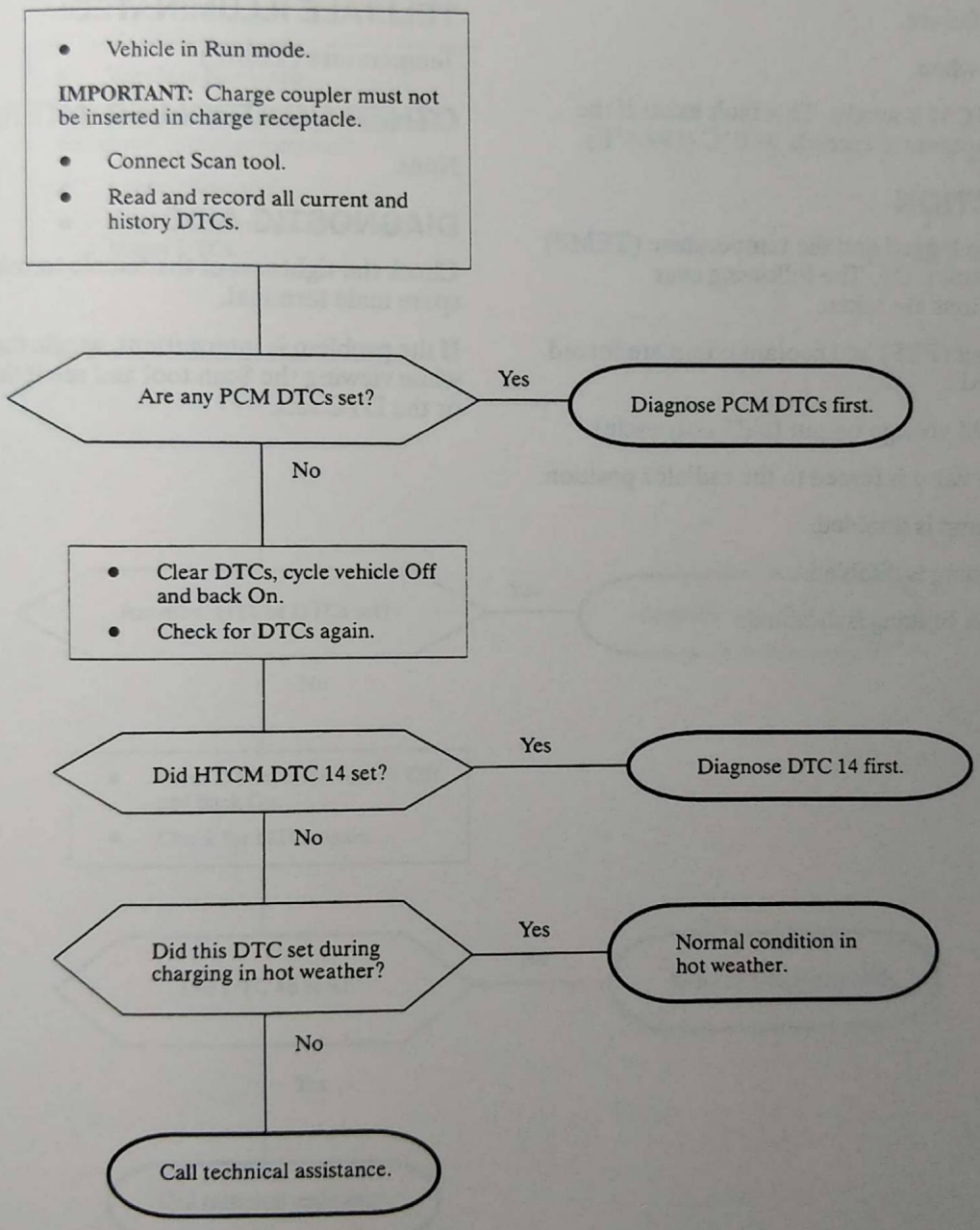
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 47
COOLANT OVER TEMPERATURE


Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
Connect Scan tool.
Read and record all current and history DTCs.
Are any PCM DTCs set?
Yes
Diagnose PCM DTCs first.
No
Clear DTCs, cycle vehicle Off and back On.
Check for DTCs again.
Did HTCM DTC 14 set?
Yes
Diagnose DTC 14 first.
No
Did this DTC set during charging in hot weather?
Yes
Normal condition in hot weather.
No
Call technical assistance.

CamScanner

DTC 48 - DRIVE MOTOR OVER TEMPERATURE

The temperature sensors are thermistors that change resistance with temperature change. The sensors have h resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module *^er (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction bl If the drive motor temperature is excessive, this DTC will be set. Ock

DTC PARAMETERS

DTC 48 will set if:

Cooling system failure.

DTC 48 will set when:

Anytime the HTCM is awake. This fault exists if the drive motor temperature exceeds 93.0°C (199.4°F).

FAILURE ACTION

This DTC will be logged and the temperature (TEMP) telltale will be turned On. The following over temperature actions are taken:

- Front end fan (FEF) and coolant pump are forced to high speed.
- (14.5V) APM voltage output (98% duty cycle)
- The coolant valve is forced to the radiator position.
- The heat pump is disabled.
- Preconditioning is disabled.
- Regenerative braking is disabled.

RELATED DTCS

HTCM 12,17, PCM 34, 36, 37

TELLTALE ILLUMINATED:

Temperature (TEMP)

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

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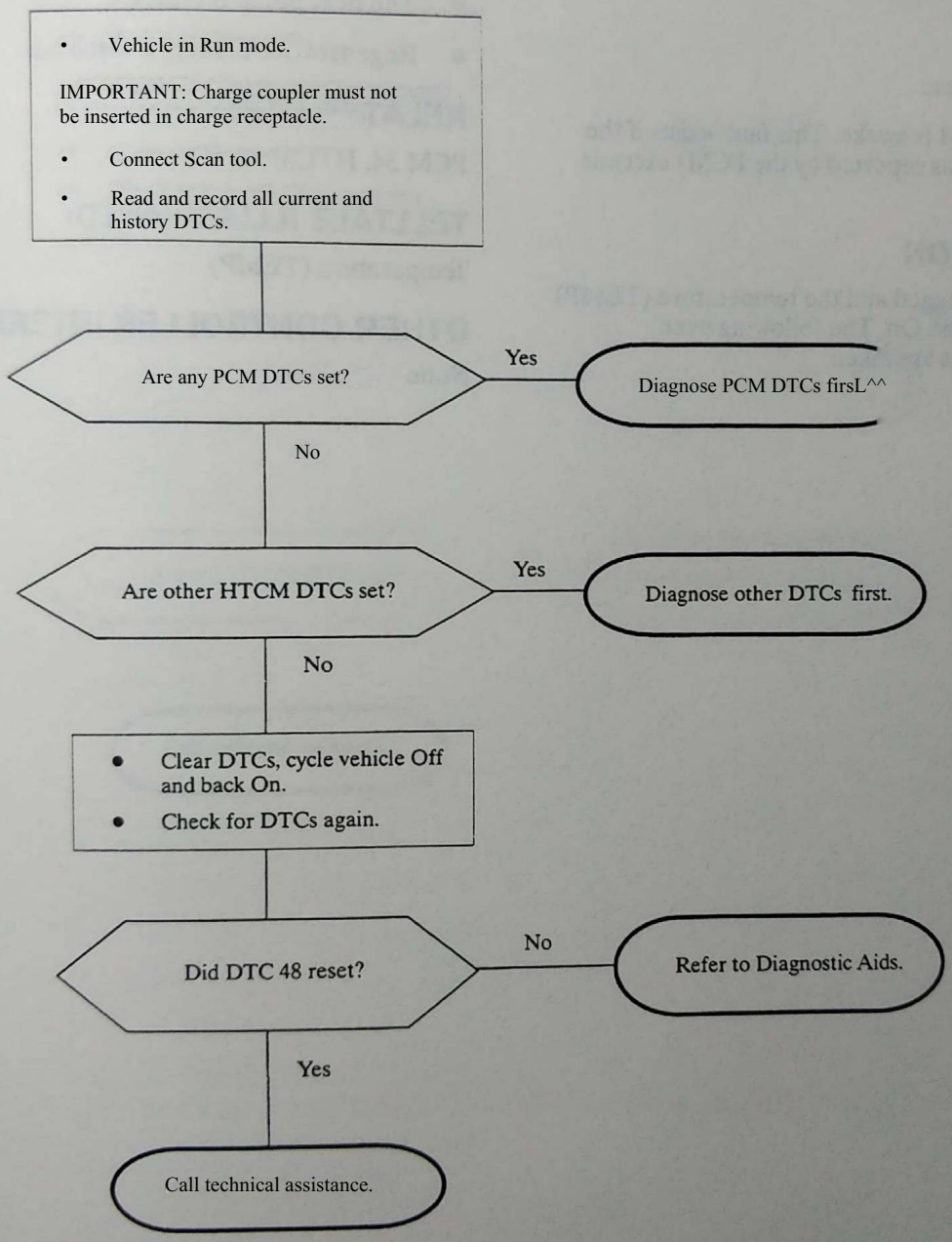
DTC 48
DRIVE MOTOR OVER TEMPERATURE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are any PCM DTCs set?
Yes
Diagnose PCM DTCs firsL^^
No
Are other HTCM DTCs set?
Yes
Diagnose other DTCs first.
No
• Clear DTCs, cycle vehicle Off and back On.
• Check for DTCs again.
Did DTC 48 reset?
No
Refer to Diagnostic Aids.
Yes
Call technical assistance.

CamScanner

DTC 49 - POWER INVERTER MODULE OVER TEMPERATURE

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The propulsion control module (PCM) monitors the power inverter modules (PIM) temperature, and reports the PIM temperature to the FI TCM over the serial data interface. If the PCM reports that the PIM temperature is excessive, this DTC will be set.

DTC PARAMETERS

DTC 49 will set if:

- Cooling system failure.
- PIM failure.

DTC 49 will set when:

Anytime the HTCM is awake. This fault exists if the PIM temperature (as reported by the PCM) exceeds 79°C (174.2°F).

FAILURE ACTION

This DTC will be logged and the temperature (TEMP) telltale will be turned On. The following over temperature actions are taken:

- FEF and coolant pump are forced to high speed (14.5V).
- The coolant valve is forced to the radiator position
- The heat pump is disabled.
- Regenerative braking is disabled.

RELATED DTCS

PCM 34, HTCM 50, 54

TELLTALE ILLUMINATED:

Temperature (TEMP)

OTHER CONTROLLER INTERFACES

None

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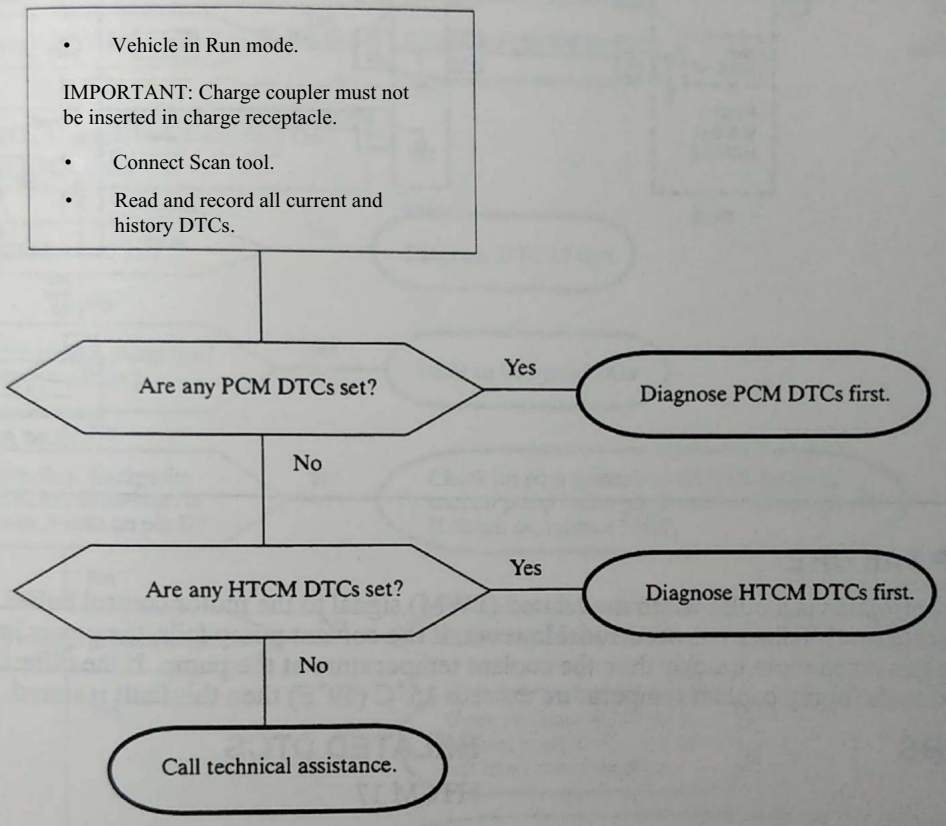
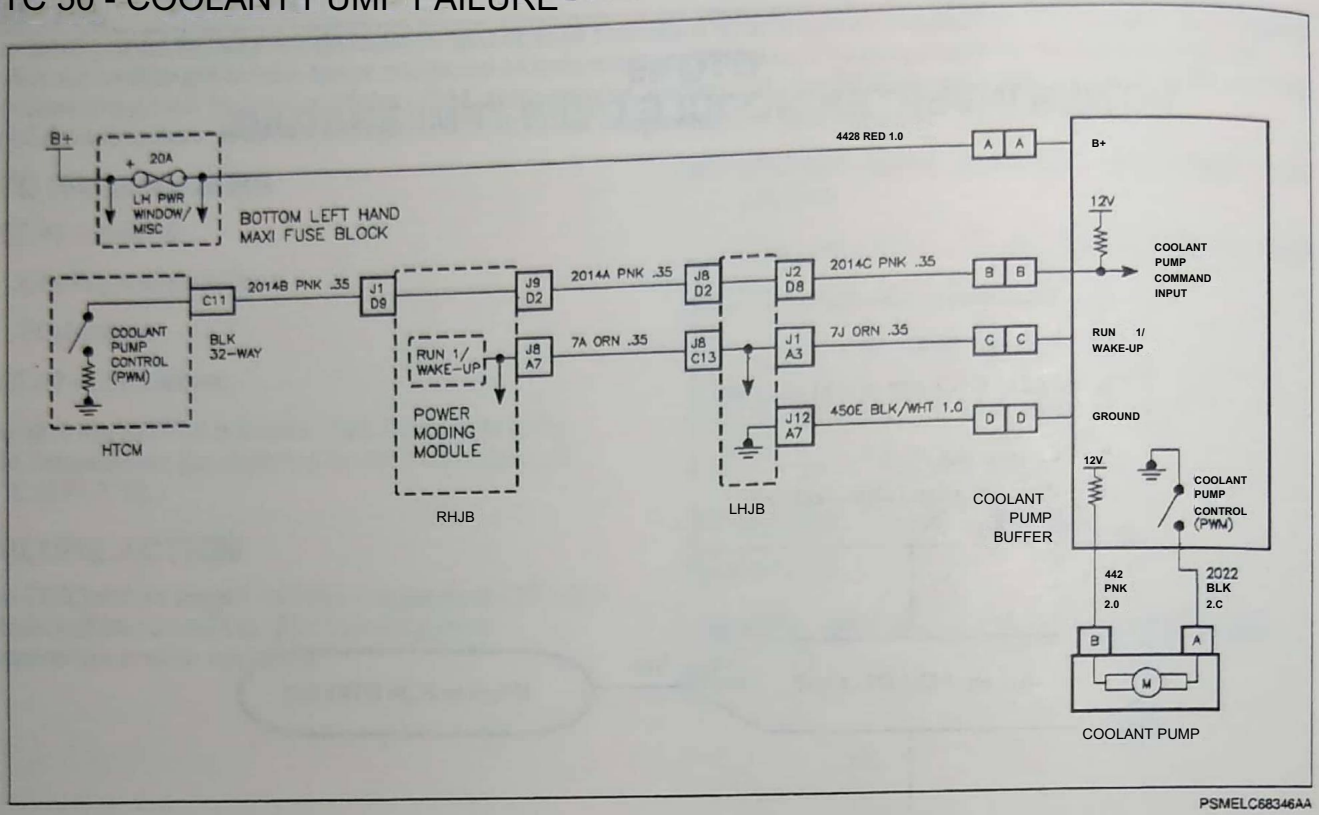
DTC 49
POWER INVERTER MODULE OVER TEMPERATURE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are any PCM DTCs set?
Yes
Diagnose PCM DTCs first.
No
Are any HTCM DTCs set?
Yes
Diagnose HTCM DTCs first.
No
Call technical assistance.

CamScanner

DTC 50 - COOLANT PUMP FAILURE



COOLANT PUMP FAILURE

The coolant pump is controlled via a pulse width modulated (PWM) signal to the motor control buffer. There is no *direct* feedback to indicate that a failure has occurred. However, if the coolant pump fails, the power inverter module *(PIM) will heat* up much more quickly than the coolant temperature at the pump. If the difference between the PIM temperature and the pump coolant temperature exceeds 15°C (59°F) then this fault is stored.

DTC PARAMETERS

DTC 50 will set if:

- Circuit 7,450E, 2014C or 442B fault.
- Coolant pump buffer failure.
- Coolant pump failure.

DTC 50 will set when:

Anytime the HTCM is awake, after the first minute of operation. This fault logic is ignored for one minute after powerup to allow the temperature to equalize. This fault exists if the PIM temperature is 15°C (59*F) greater than the coolant temperature.

FAILURE ACTION

This DTC will be logged and the temperature (TEMP) telltale will be turned On. In addition, both the rear defogger and the cabin blower are disabled (shed). Finally, the following over temperature actions are taken:

- The heat pump is disabled.
- Charging is disabled while in Run.
- Regenerative braking is disabled.

RELATED DTCS

HTCM 17

TELLTALE ILLUMINATED:

SERVICE SOON

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

This DTC may set in high temperatures if the vehic le is driven aggressively (wide open throttle operation and/or up steep inclines). If the DTC was set un er these conditions, it may be considered normal.

This DTC may set if the pump coolant temperature sensors become skewed. This condition may be checked by allowing the vehicle to soak to ambient temperature (this usually takes about three hours) and comparing the temperature sensor readings using a scan tool. The sensors should read within three degrees of each other.

*Select General Information from the Scan tool nt CM menu.

Check the tightness of the female terminal grip with a spare male terminal.

DTC 50
COOLANT PUMP FAILURE

t Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

t Connect Scan tool.

• Read and record all current and history DTCs.

Are any PCM DTCs set? — Yes ----- ^Diagnose PCM DTCs first^

No

• Clear DTCs. cycle vehicle Off and back On.
• Check for DTCs again.

Is HTCM DTC 17 set? — Yes -^Diagnose DTC 17 firs^

No

Does the coolant pump run? (Observe vent lines.) — Yes < (Refer to Diagnostic Aids. J

No

Vehicle in Run. Backprobe coolant buffer connector. Is there over .3 volts on pin D? — Yes f Check for poor ground circuit 450E between ^X (coolant pump buffer pin D and LHJB JI2 pin A7.) \If circuit ok, replace LHJB. ^^Z

No

<C^lsbattery voltage present on pin i A?^> — N° — Does left power window work? — No — Refer to "Power Window \ Diagnosis" in the "Electrical 1 Service Manual." J

Yes

Open in circuit 442B between coolant pump buffer and bottom left hand maxi fuse block. J

Is battery voltage present on pin C in Run mode? — No --------- Check for an open in circuit 7J between coolant ^X pump buffer pin C and LHJB JI pin A3. J
• If circuit ok, replace LHJB.

Yes

Is pin B showing less than 1.0 volts? — Yes ■^^teplace coolant pump/buffer asm^

No

Disc LHJB J2 connector - does LHJB J2 pin D8 show battery volts 7/^" — No
• Check for open in circuit 2014C.
• If circuit ok, replace coolant pump/buffer asm-x

Yes

<ZA^n^Co Slect LHJB J2 connector. \ TQ- RSC J9 connector - does RHJB pin D2 show battery volts? — No
• Check for open in circuit 2014A.
• If circuit ok, replace LHJB.

Yes

Re ni Dk CO ^Cl RHJB J9 connector. \ Disc HTCM -does HTCM \~l°r Pln C11 show battery volts? — No
• Check for open in circuit 2014B.
• If circuit ok, replace RHJB. ^^Z

Yes

(^ Replace HTCM

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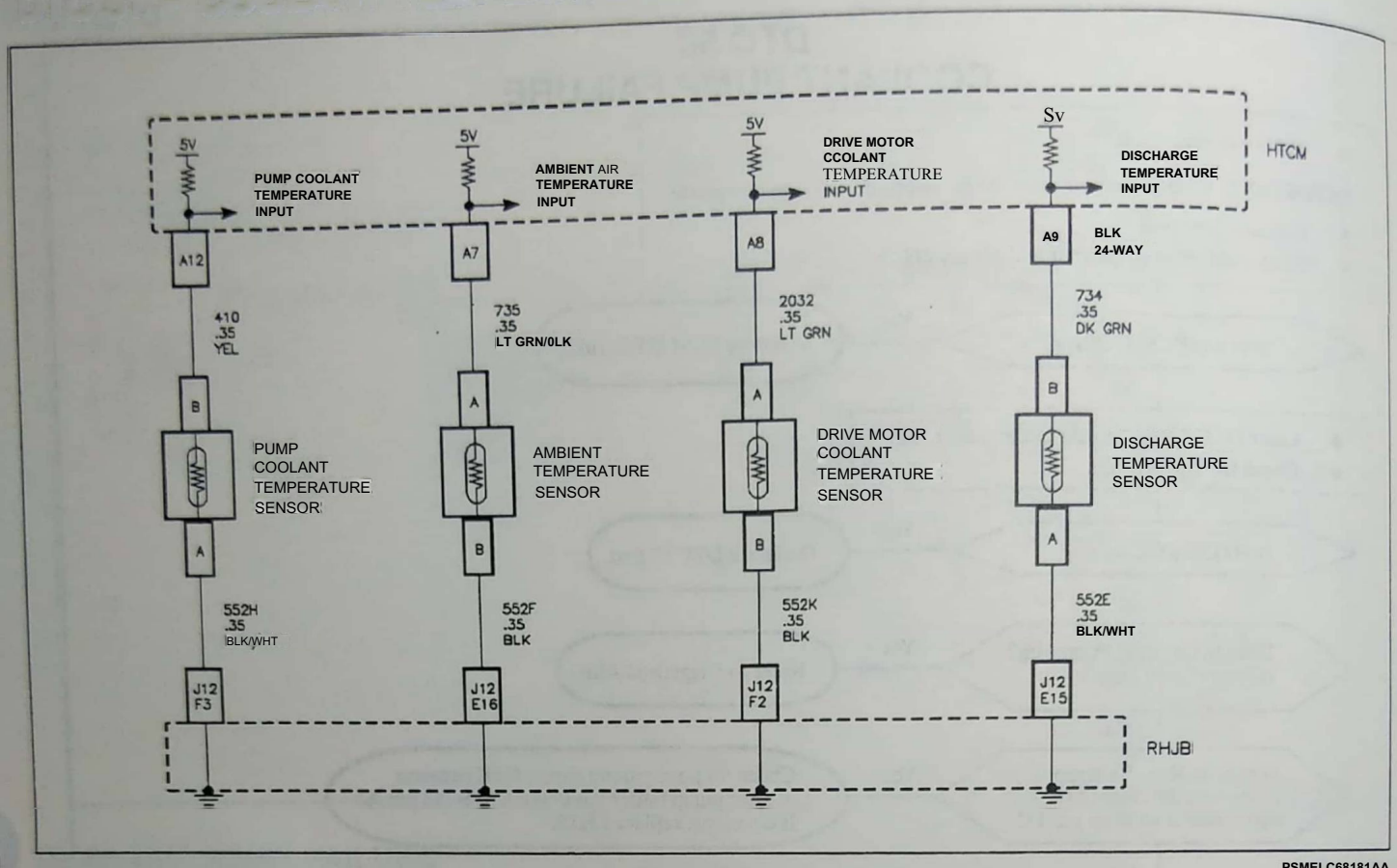
DTC 51 - COOLANT TEMPERATURE HEAT PUMP OVERRIDE



PSMELC68181AA

COOLANT TEMPERATURE HEAT PUMP OVERRIDE

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The HPVS/thermal control module (HTCM) will attempt to control an overheating condition by limiting the heat pump speed. If the coolant temperature reaches 63°C (145°F), the HTCM will reduce/limit the compressor motor control (CMC) power requested to 1150 watts. If the coolant temperature reaches 66° C (150°F), the HTCM will reduce/limit the compressor motor control (CMC) power requested to 600 watts. If the coolant temperature is greater than 71 'C (160°F), this DTC will be set, and the heat pump will be disabled.

DTC PARAMETERS

DTC 51 will set if:

- High ambient temperature/high load operation.
- Cooling system failure.

DTC 51 will set when:

Anytime the HTCM is awake.

FAILURE ACTION

This DTC will be logged and the SERVICE SOON light will be turned On. The front end fan and coolant pump will be commanded to high speed (14.5v), the coolant valve will be forced to the radiator position, and the heat pump will be disabled.

RELATED DTCS

HHTCM14

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

This DTC may set in high temperatures if the vehicle is driven aggressively (wide open throttle operation and/or up steep inclines). If the DTC was set under these conditions, it may be considered normal.

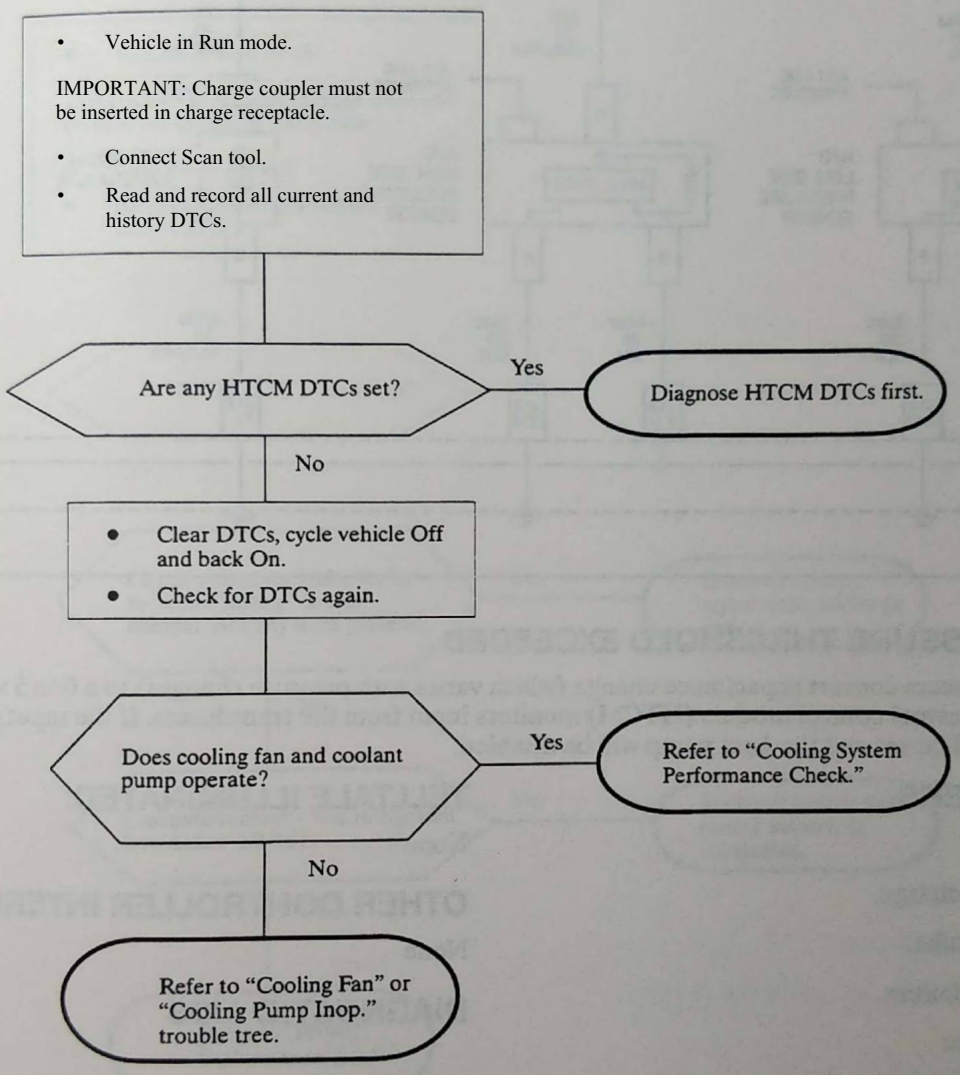
This DTC may set if the pump coolant temperature sensor value becomes skewed. This condition may be checked by allowing the vehicle to soak to ambient temperature (this usually takes about three hours) and comparing the various temperature sensor readings using a Tech 2 scan tool*. The sensors should read within three degrees of each other.

*Select General Information from the Scan tool HTCM menu.

Check the tightness of the female terminal grip with a spare male terminal.

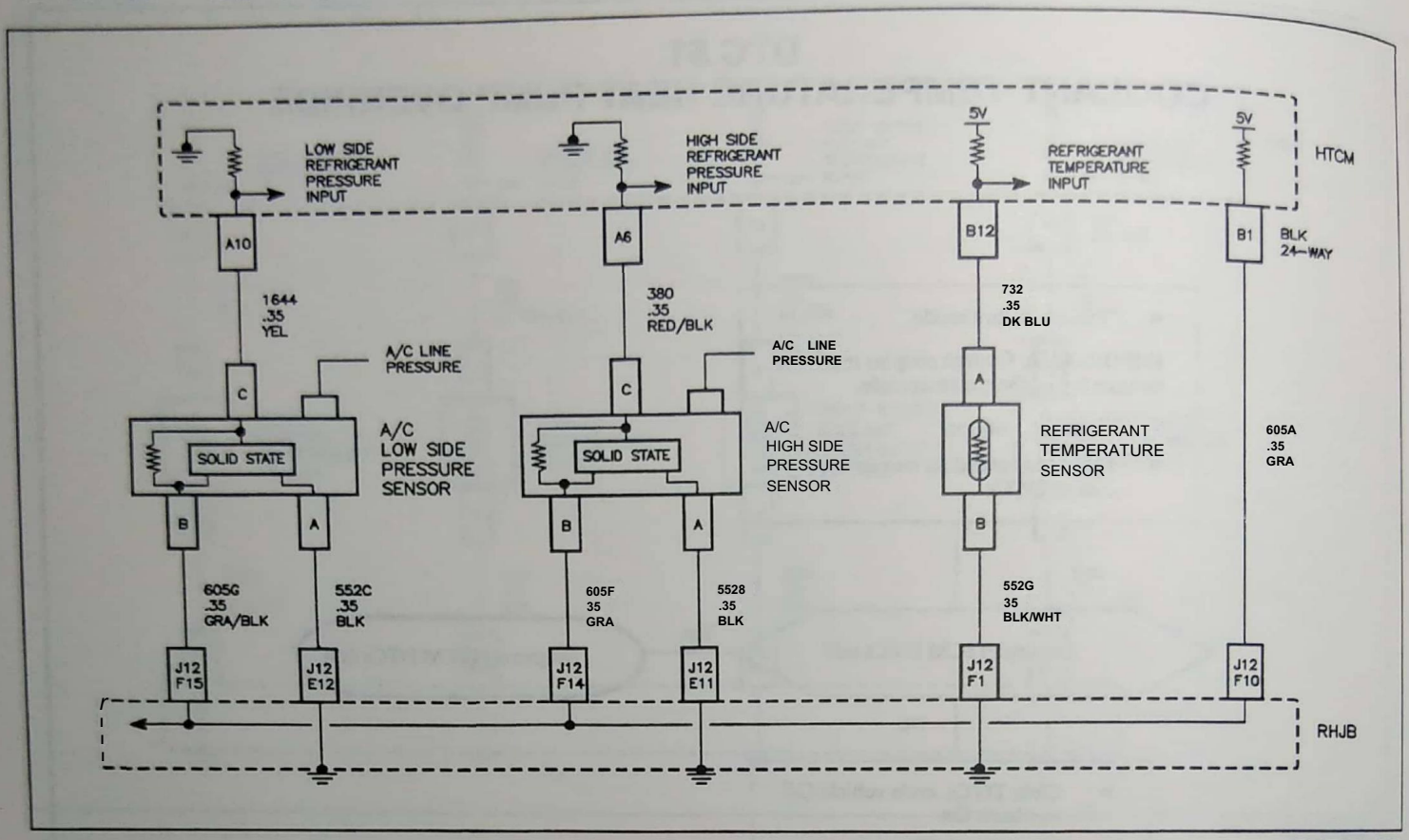
CamScanner

DTC 51
COOLANT TEMPERATURE HEAT PUMP OVERRIDE


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are any HTCM DTCs set?
Yes
Diagnose HTCM DTCs first.
No
• Clear DTCs, cycle vehicle Off and back On.
• Check for DTCs again.
Does cooling fan and coolant pump operate?
Yes
Refer to "Cooling System Performance Check."
No
Refer to "Cooling Fan" or "Cooling Pump Inop." trouble tree.

CamScanner

DTC 52 - LOW SIDE PRESSURE THRESHOLD EXCEEDED



PSMELC68180AA

LOW SIDE PRESSURE THRESHOLD EXCEEDED

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The HPVS/thermal control module (HTCM) monitors input from the transducers. If the input goes below normal, this fault will be set and the heat pump will be disabled.

DTC PARAMETERS

DTC 52 will set if:

- Low refrigerant charge.
- Blocked orifice tube.
- Reversing valve failure.

DTC 52 will set when:

Anytime the HTCM is awake and the heatpump is running. If pressure falls below 20 kPa (3 psi) in heat or DeFox mode or below 100 kPa (14.5 psi) in cool mode.

FAILURE ACTION

This fault will be logged, the SERVICE SOON telltale will be turned On, and heat pump operation will be disabled.

RELATED DTCS

HTCM 11,16

TELLTALE ILLUMINATED:

None

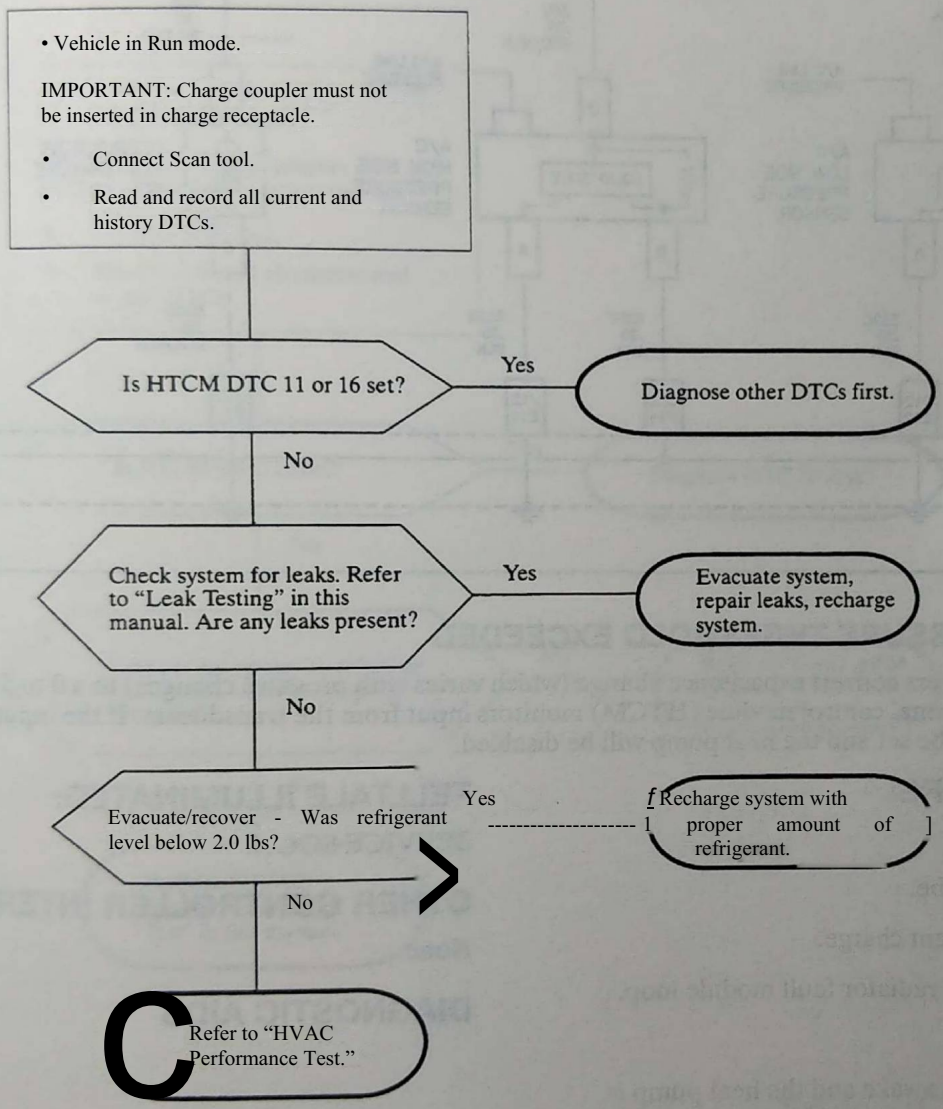
OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

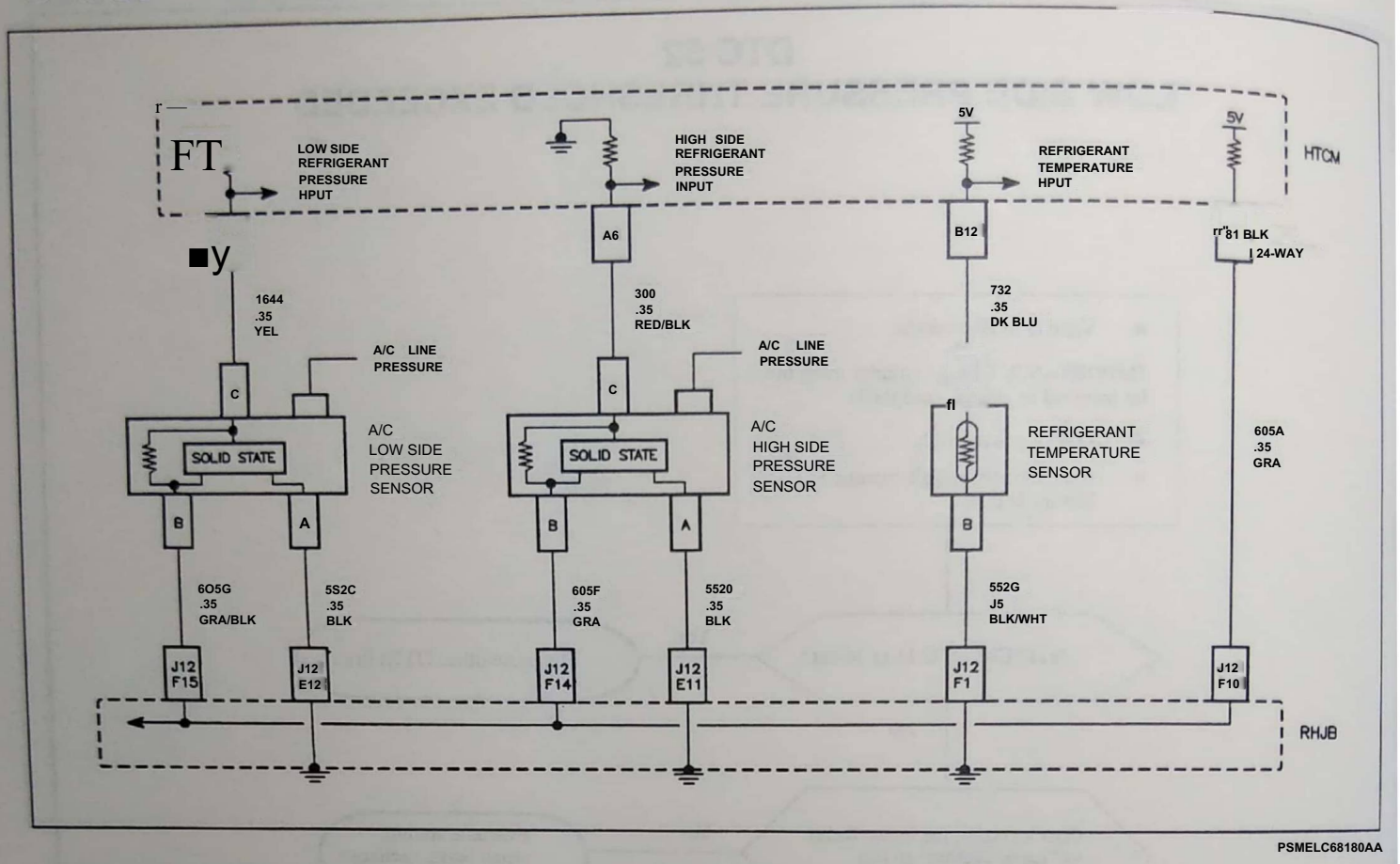
CamScanner

DTC 52
LOW SIDE PRESSURE THRESHOLD EXCEEDED


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Is HTCM DTC 11 or 16 set?
Yes
Diagnose other DTCs first.
No
Check system for leaks. Refer to "Leak Testing" in this manual. Are any leaks present?
Yes
Evacuate system, repair leaks, recharge system.
No
Evacuate/recover - Was refrigerant level below 2.0 lbs?
Yes
Recharge system with proper amount of refrigerant.
No
C
Refer to "HVAC Performance Test."

CamScanner

DTC 53 - HIGH SIDE PRESSURE THRESHOLD EXCEEDED



PSMELC68180AA

HIGH SIDE PRESSURE THRESHOLD EXCEEDED

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The HPVS/thermal control module (HTCM) monitors input from the transducers. If the input goes above normal, this fault will be set and the heat pump will be disabled.

DTC PARAMETERS

DTC 53 will set if:

- Blocked orifice tube.
- Excessive refrigerant charge.
- CRFM condenser radiator fault module inop.

DTC 53 will set when:

Anytime the HTCM is awake and the heat pump is running. If pressure rises above 2800 kPa (406 psi), this DTC will set.

FAILURE ACTION

This fault will be logged, the SERVICE SOON telltale will be turned On, and heat pump operation will be disabled.

RELATED DTCS

HTCM 10

TELLTALE ILLUMINATED:

SERVICE SOON.

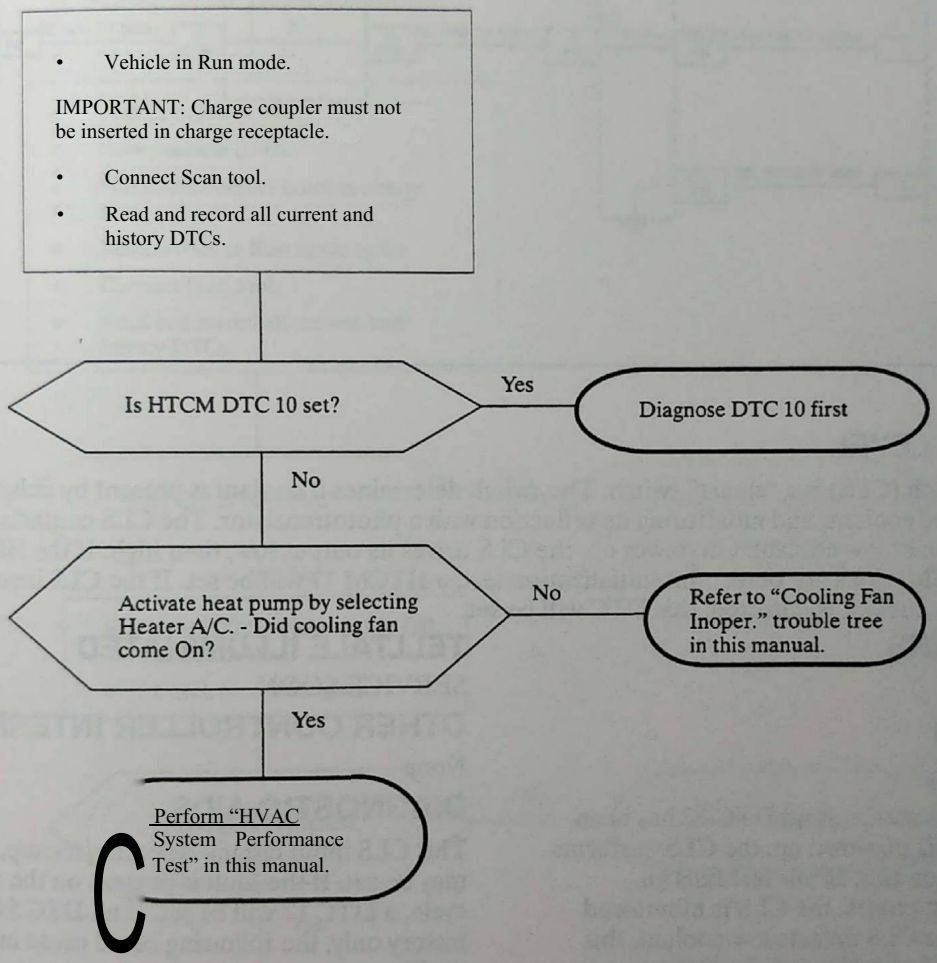
OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

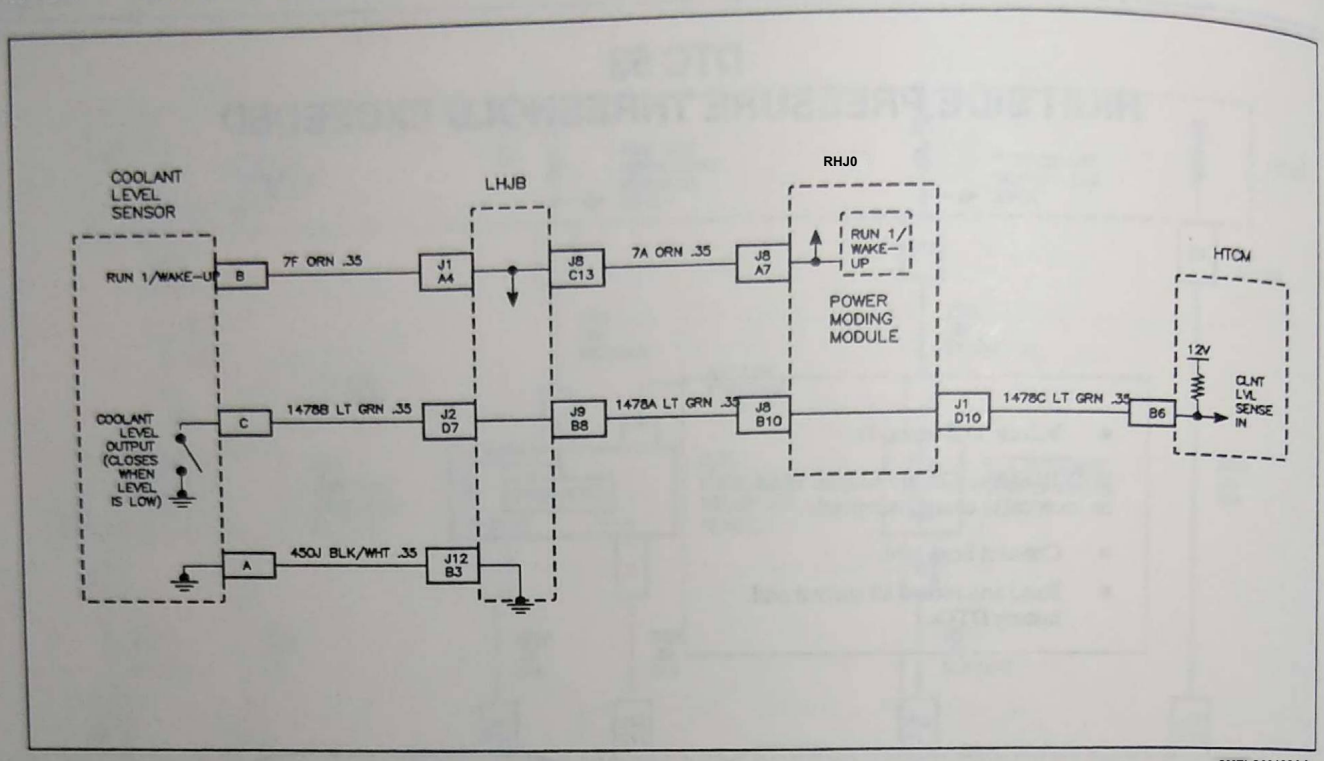
CamScanner

DTC 53
HIGH SIDE PRESSURE THRESHOLD EXCEEDED


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Is HTCM DTC 10 set?
Yes
Diagnose DTC 10 first
No
Activate heat pump by selecting Heater A/C. - Did cooling fan come On?
No
Refer to "Cooling Fan Inoper." trouble tree in this manual.
Yes
Perform "HVAC System Performance Test" in this manual.
C

CamScanner

DTC 54 - LOW COOLANT LEVEL



eSMELC60182AA

LOW COOLANT LEVEL

The coolant level switch (CLS) is a "smart" switch. The switch determines if coolant is present by pulsing a light emitting diode into the coolant, and monitoring its reflection with a phototransistor. The CLS contains filtering to prevent false detection of low coolant. On power up, the CLS drives its output low, then high. If the HPVS/thermal control module (HTCM) does not detect this initialization test, a HTCM 17 will be set. If the CLS input circuit fails after startup, or if low coolant is detected, this DTC will be set.

DTC PARAMETERS

DTC 54 will set if:

• Low coolant level

DTC 54 will set when:

Anytime the HTCM is awake, if no DTC 17 has been set. When the vehicle is powered up, the CLS performs a power up initialization test. If this test fails an HTCM 17 is set. If test passes, the CLS is monitored for coolant level. If the CLS detects low coolant, this fault is set. If the CLS input circuit fails after startup, a 54 may be set. If the fault is present on the next Run cycle, a DTC 17 will be set.

FAILURE ACTION

The SERVICE SOON light will be turned On. Information is passed (via serial data) to the PCM and BPM indicating that the coolant level is low. The following over temperature actions are taken:

- The heat pump is disabled.
- Charging is disabled.
- Preconditioning is disabled.
- Regenerative braking is disabled.

RELATED DTCS

HTCM 17, BPM 296

TELLTALE ILLUMINATED

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

This CLS input circuit fails after startup, a DTC 54 may be set. If the fault is present on the next RUN cycle, a DTC 17 will be set. If an DTC 54 is found in history only, the following could cause intermittent problems:

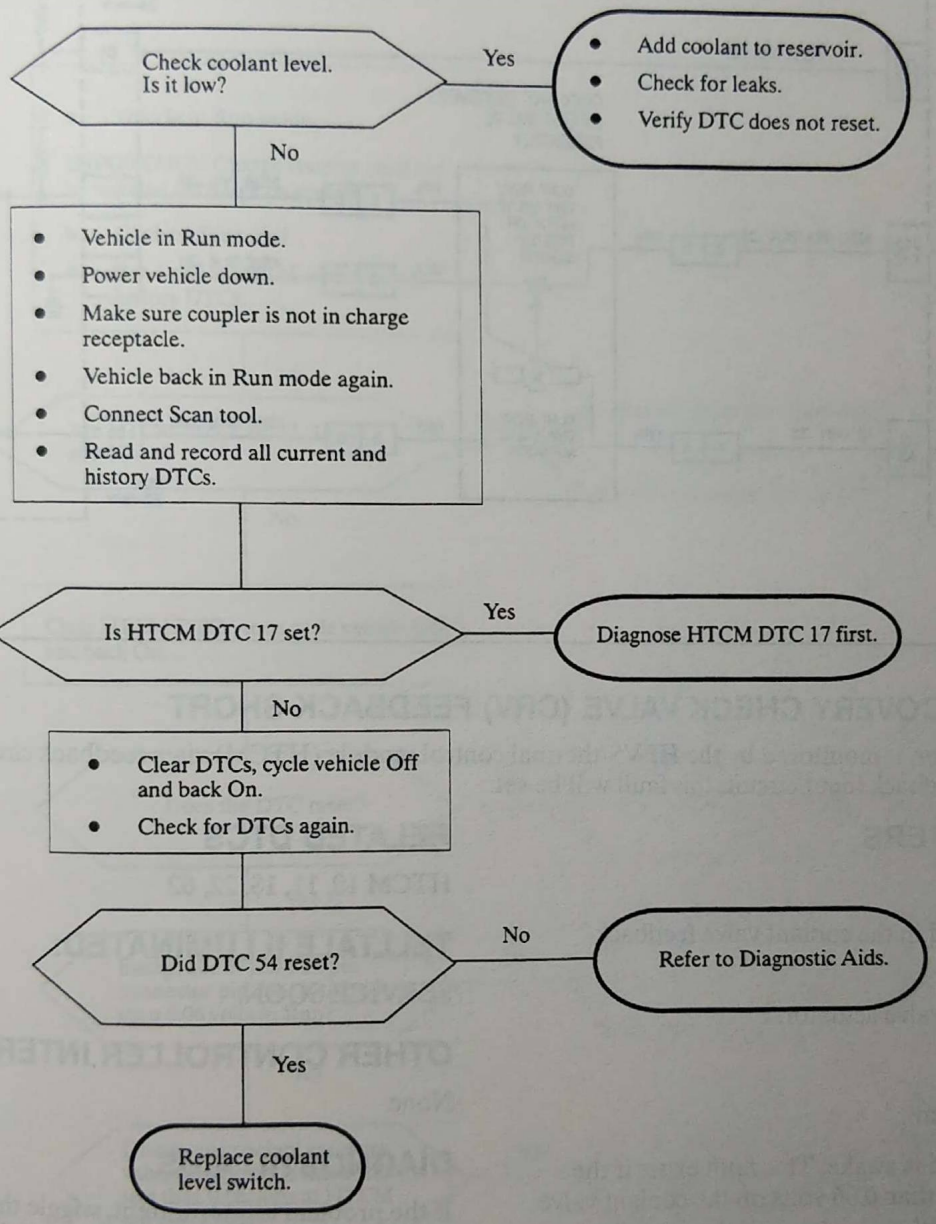
- CLS input circuit open or shorted to voltage or ground.
- CLS Run 1 circuit open or shorted to ground.
- CLS ground circuit open.
- Faulty coolant level sensor.
- HTCM failure.

When attempting to diagnose an intermittent problem, use the Scan tool* and review malfunction history diagnostic information. This data can be used to determine the condition that were present when the DTC set.

• Select General Information from the Scan tool HTCM menu.
Check the tightness of the female terminal grip with a spare male terminal.

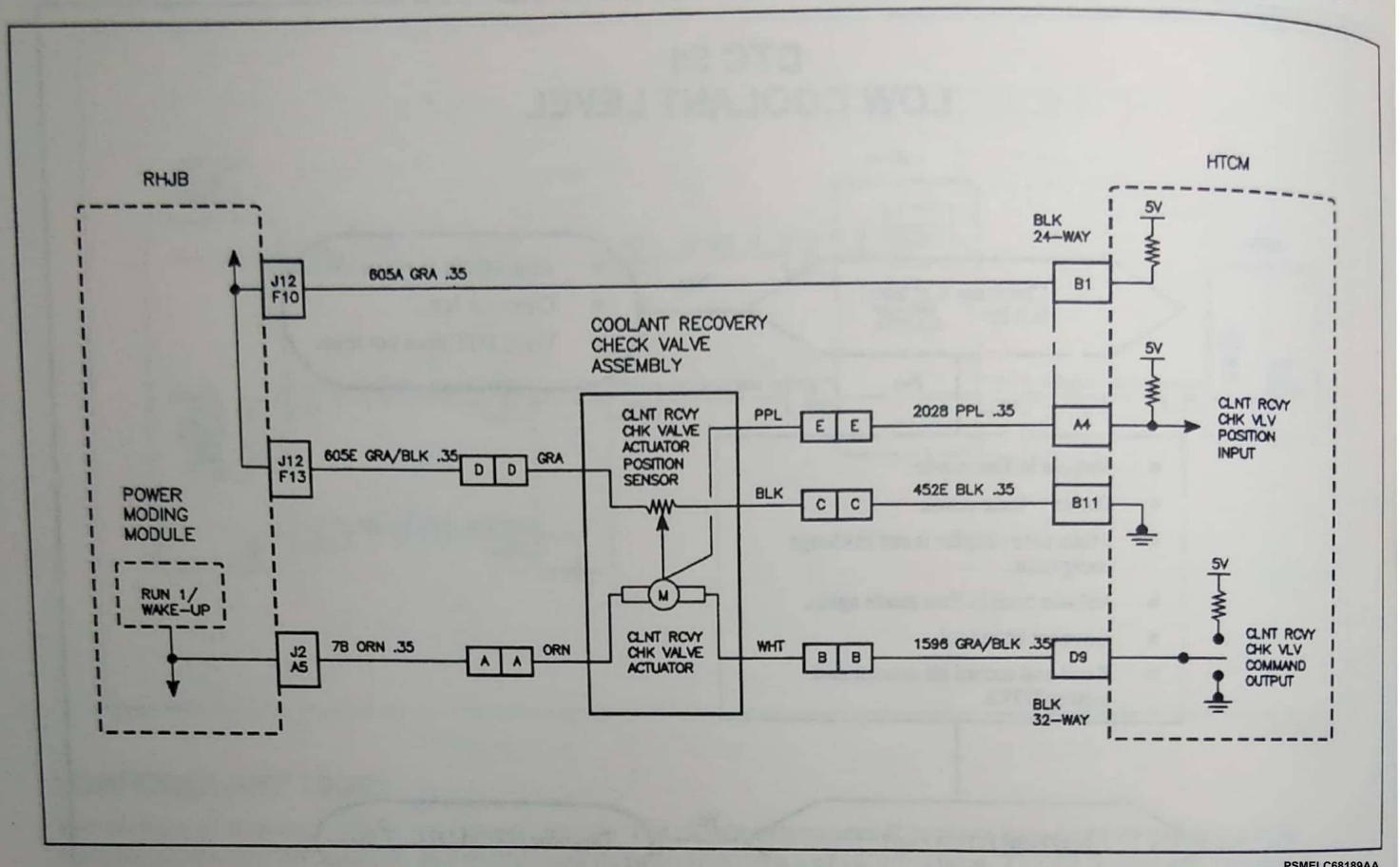
CamScanner

DTC 54
LOW COOLANT LEVEL



CamScanner

DTC 58 - COOLANT RECOVERY CHECK VALVE (CRV) FEEDBACK SHORf



PSMELC68189AA

COOLANT RECOVERY CHECKVALVE (CRV) FEEDBACK SHORT

The actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If a fault is detected on the feedback input circuit, this fault will be set.

DTC PARAMETERS

DTC 58 will set if:

- Short to ground in the coolant valve feedback circuit.
- Faulty coolant valve actuator.
- HTCM failure.

DTC 58 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts on the coolant valve feedback input circuit.

FAILURE ACTION

This DTC will be logged, and the SERVICE SOON telltale will be illuminated.

RELATED DTCS

HTCM 10,11,18, 22, 62

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

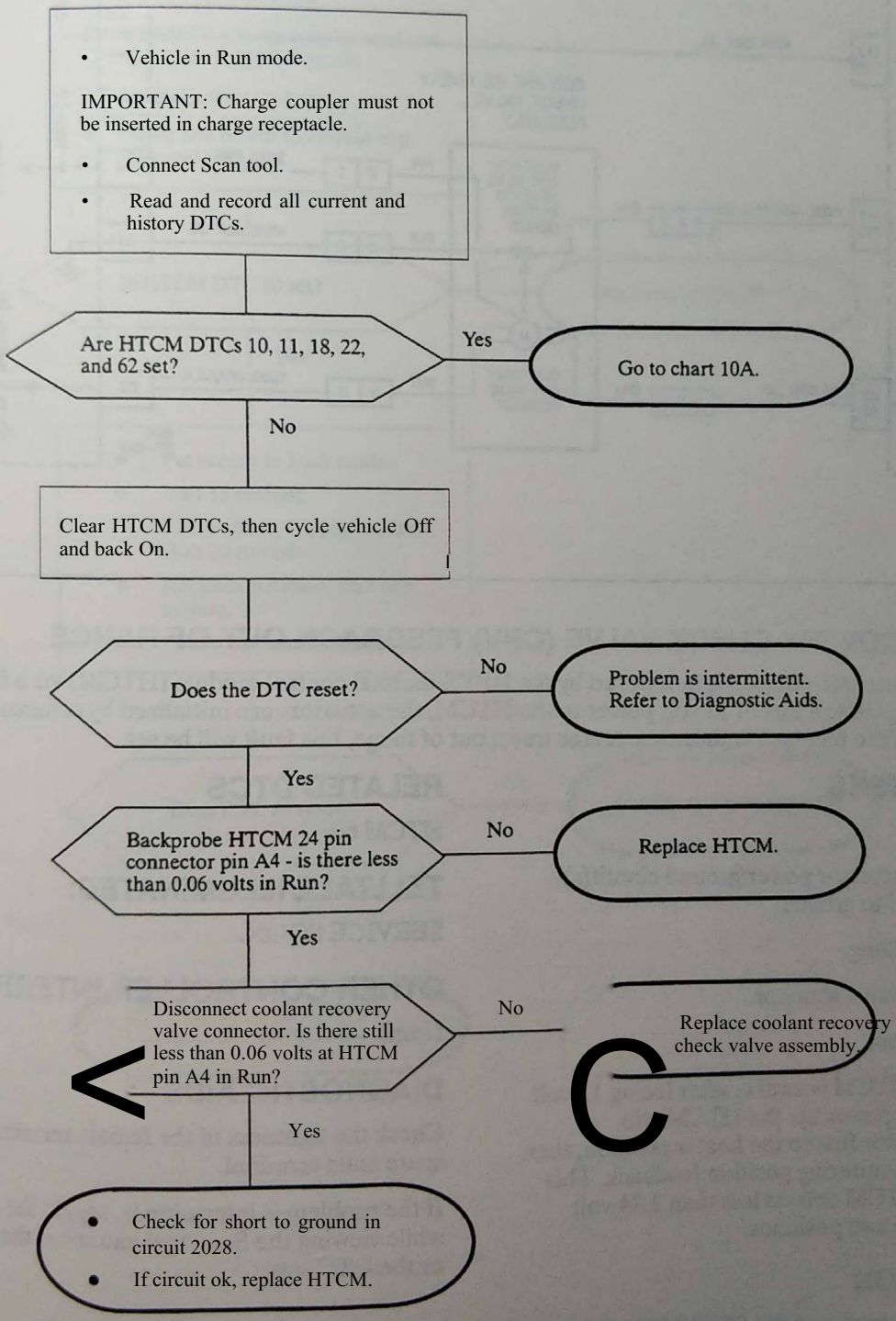
None

DIAGNOSTIC AIDS

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

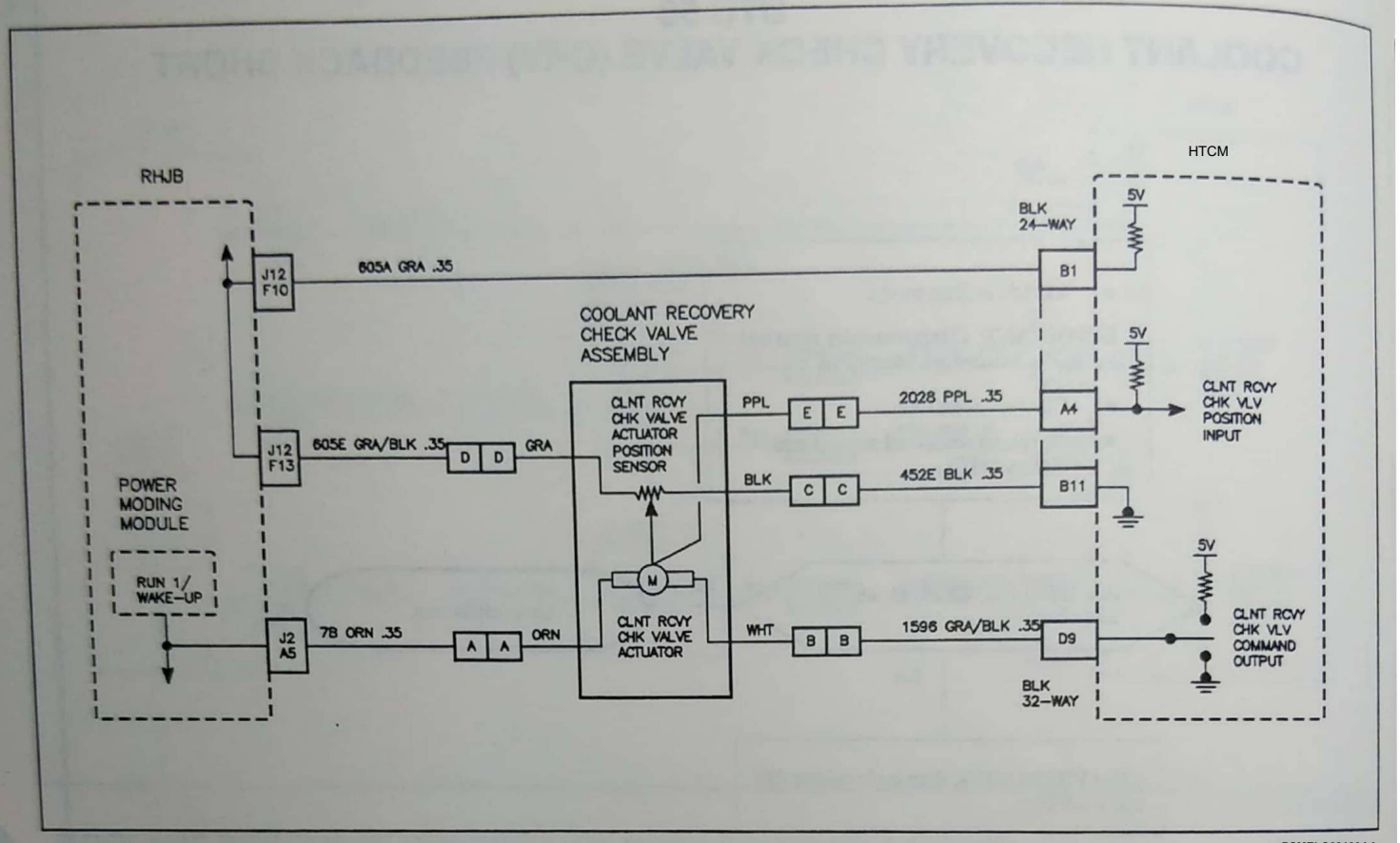
CamScanner

DTC 58
COOLANT RECOVERY CHECK VALVE (CRV) FEEDBACK SHORT


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
Are HTCM DTCs 10, 11, 18, 22, and 62 set?
Yes
Go to chart 10A.
No
Clear HTCM DTCs, then cycle vehicle Off and back On.
Does the DTC reset?
No
Problem is intermittent. Refer to Diagnostic Aids.
Yes
Backprobe HTCM 24 pin connector pin A4 - is there less than 0.06 volts in Run?
No
Replace HTCM.
Yes
Disconnect coolant recovery valve connector. Is there still less than 0.06 volts at HTCM pin A4 in Run?
No
Replace coolant recovery check valve assembly.
Yes
• Check for short to ground in circuit 2028.
• If circuit ok, replace HTCM.

CamScanner

DTC 59 - COOLANT RECOVERY CHECK VALVE (CRV) FEEDBACK OUT OF RANGE



PSMELC68189AA

COOLANT RECOVERY CHECK VALVE (CRV) FEEDBACK OUT OF RANGE

The coolant valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. On power up after a loss of 12 volt power to the HTCM, the actuators are initialized by commanding travel to both positions. If the feedback indicates actuator travel out of range, this fault will be set.

DTC PARAMETERS

DTC 59 will set if:

- Coolant valve actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty coolant valve actuator.

DTC 59 will set when:

The first time the HTCM is awake, after losing 12 volt power. On this first power up, the HTCM will command the actuator first to the heater position, then to radiator, while monitoring position feedback This fault exists if the HTCM detects less than 3.74 volt change between the two positions.

FAILURE ACTION

This DTC will be logged, and the SERVICE SOON telltale will be illuminated.

RELATED DTCS

HTCM 60

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 59

COOLANT RECOVERY CHECK VALVE (CRV) FEEDBACK OUT OF RANGE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history DTCs.

Is HTCM DTC 60 set? — Yes → Refer to HTCM DTC 60.

No

- Put vehicle in Lock mode.
- Wait 15 seconds.
- Pull auxilliary battery maxifuse. Wait 20 seconds.
- Reinstall maxifuse. Wait one minute.
- Put vehicle back in Run mode.

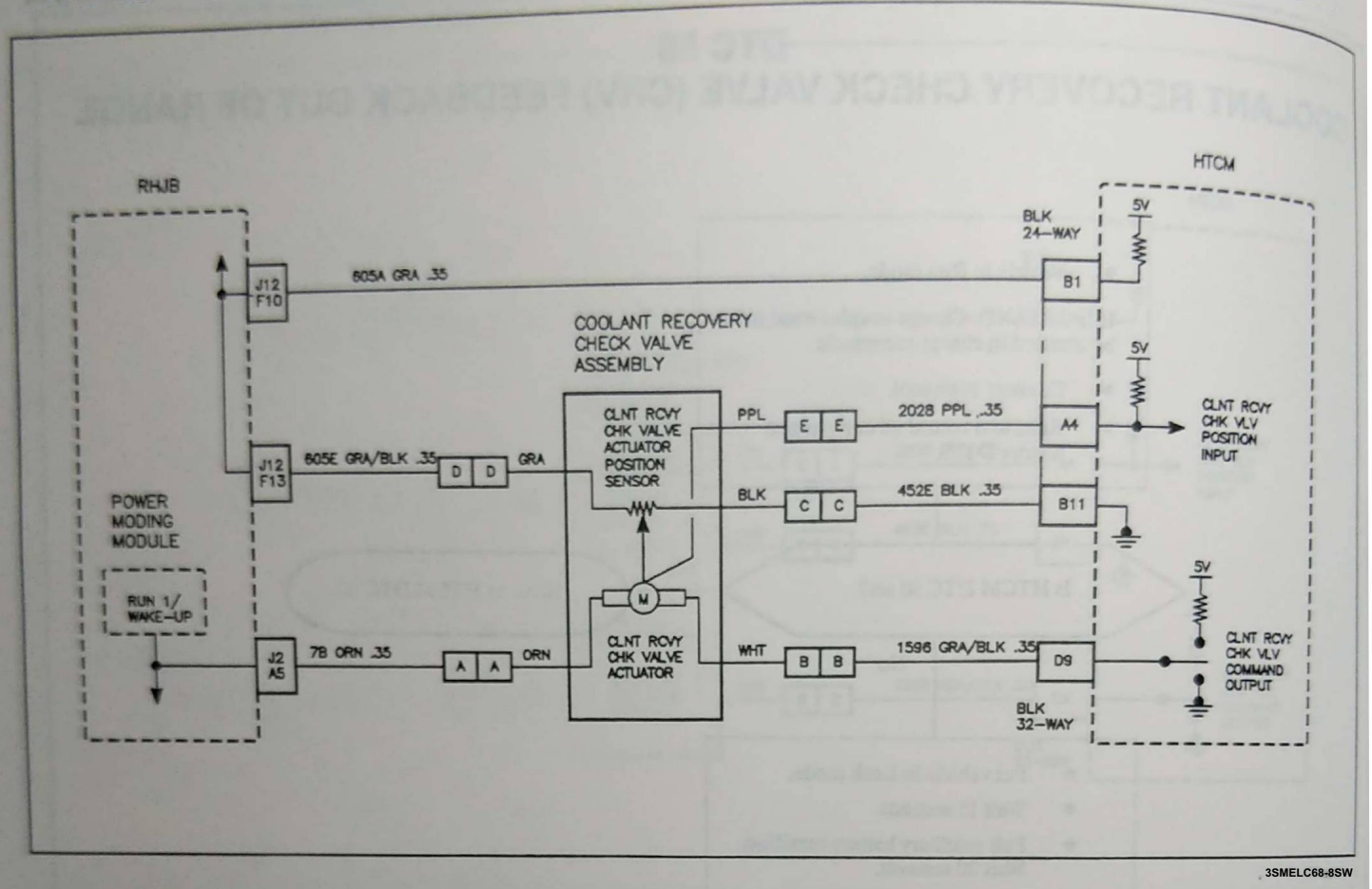
Does DTC 59 reset? — No → Vehicle operating normally.

Yes

Replace valve actuator assembly.

CamScanner

=^TcOoZaNT RECOVERY CHECK VALVE (CRV) NOT RESPpg^



3SMELC68-8SW

COOLANT RECOVERY CHECK VALVE (CRV) NOT RESPONDING

The coolant valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If the feedback indicates that the actuator did not respond properly to a command, this fault will be set.

DTC PARAMETERS

DTC 60 will set if:

- Coolant valve actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty coolant valve actuator.
- Feedback circuit open/shorted.

DTC 60 will set when:

Anytime the coolant valve actuator feedback indicates that the actuator did not reach the commanded position.

FAILURE ACTION

This DTC will be logged, and the SERVICE SOON telltale will be illuminated.

RELATED DTCS

HTCM 58,59

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire [illegible] while viewing the Scan tool and see if the value [illegible] or the DTC sets.

CamScanner

DTC 60
COOLANT RECOVERY CHECKVALVE (CRV) NOT RESPONDING

t Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

, Connect Scan tool.

• Read and record all current and history DTCs.

Is DTC 60 current?

No

- Select heat mode, wait 15 seconds.
- Select vent mode, wait 15 seconds.

Yes

Yes

Did DTC 60 reset?

No

Problem is intermittent. Refer to Diagnostic Aids.

Disconnect coolant valve. Is there over 4.8 volts on pin D of connector?

No

- Check for open in circuit 605E from coolant valve to right hand junction block (RHJB).
- If circuit ok, replace RHJB.

Yes

Is there battery volts on pin A of connector?

No

- Check for open in circuit 7B from coolant valve to RHJB.
- If circuit ok, replace RHJB.

Yes

Is therefor 4.8 volts on pin E of connector?

No

- Check for open/short circuit 2028 from coolant valve to HTCM.
- If circuit ok, replace HTCM.

Yes

Important: Put vehicle in Lock mode.

Is there less than five ohms to ground on pin C of connector?

No

- Check for open/short in circuit 2028 from coolant valve to HTCM.
- If circuit ok, replace HTCM.

Yes

Is pin B showing less than 3000 ohms to ground?

No

- Check for short to ground circuit 1596 from coolant valve to HTCM.
- If circuit ok, replace HTCM.

Yes

Is pin B showing over 7000 ohms to ground?

Yes

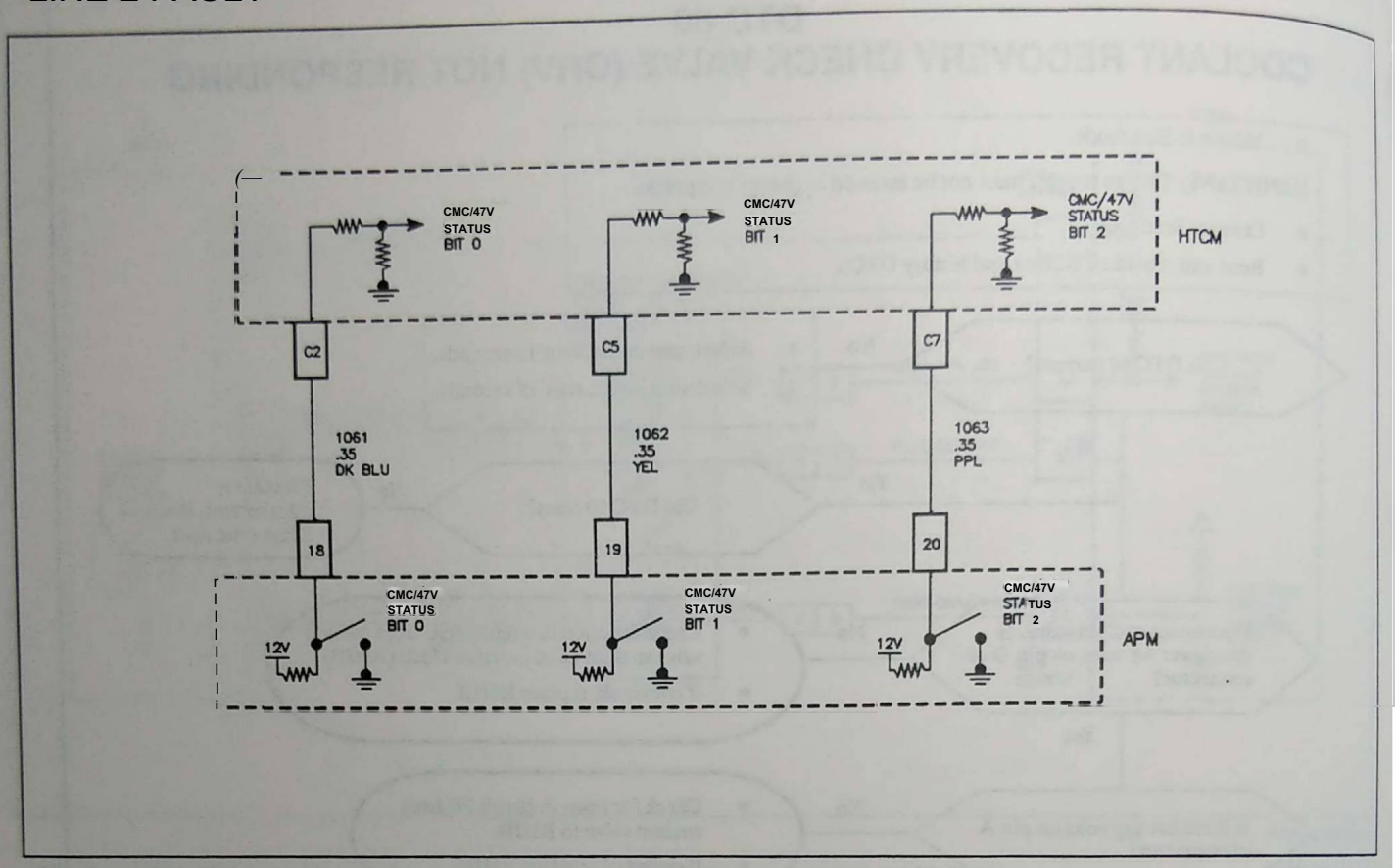
- Check for open in circuit 1596 between HTCM and coolant valve.
- If circuit ok, replace HTCM.

No

Replace coolant valve.

CamScanner

DTC 61 - 47V/COMPRESSOR MOTOR CONTROL (CMC) STATUS LINE 2 FAULT



PSMELC63190AA

47V/COMPRESSOR MOTOR CONTROL (CMC) STATUS LINE 2 FAULT

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The HPVS/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once every second for one second to allow 47 volt and compressor motor control (CMC) fault detection at the same time. If status line 2 fails to toggle for three consecutive cycles, this fault will be reported.

DTC PARAMETERS

DTC 61 will set if:

- Open or short circuit on 47V/CMC status line 2.
- HTCM fault.
- APM fault.

DTC 61 will set when:

Anytime the HTCM is awake.

FAILURE ACTION

This DTC will be logged. Faults that are normally detected via the 47V/CMC status lines will be ignored while this fault is present.

RELATED DTCS

None

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

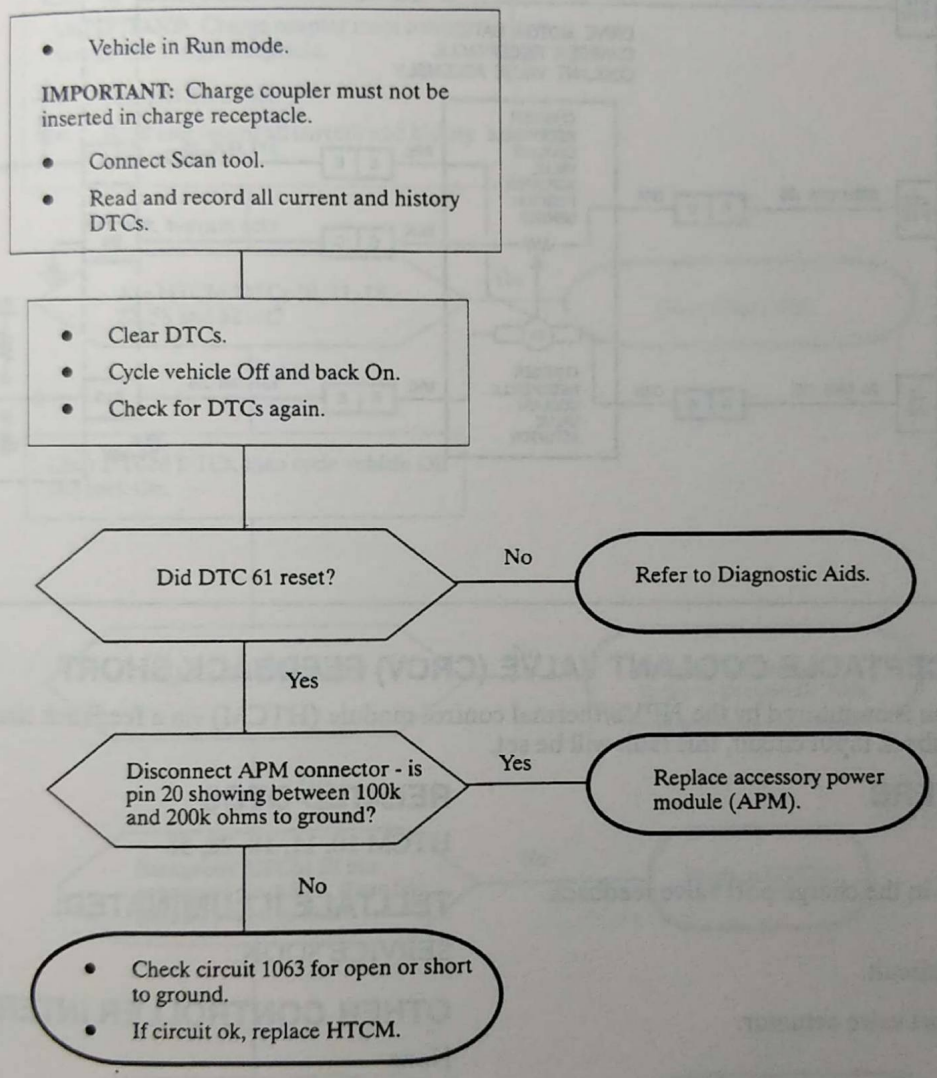
DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value change or the DTC sets.

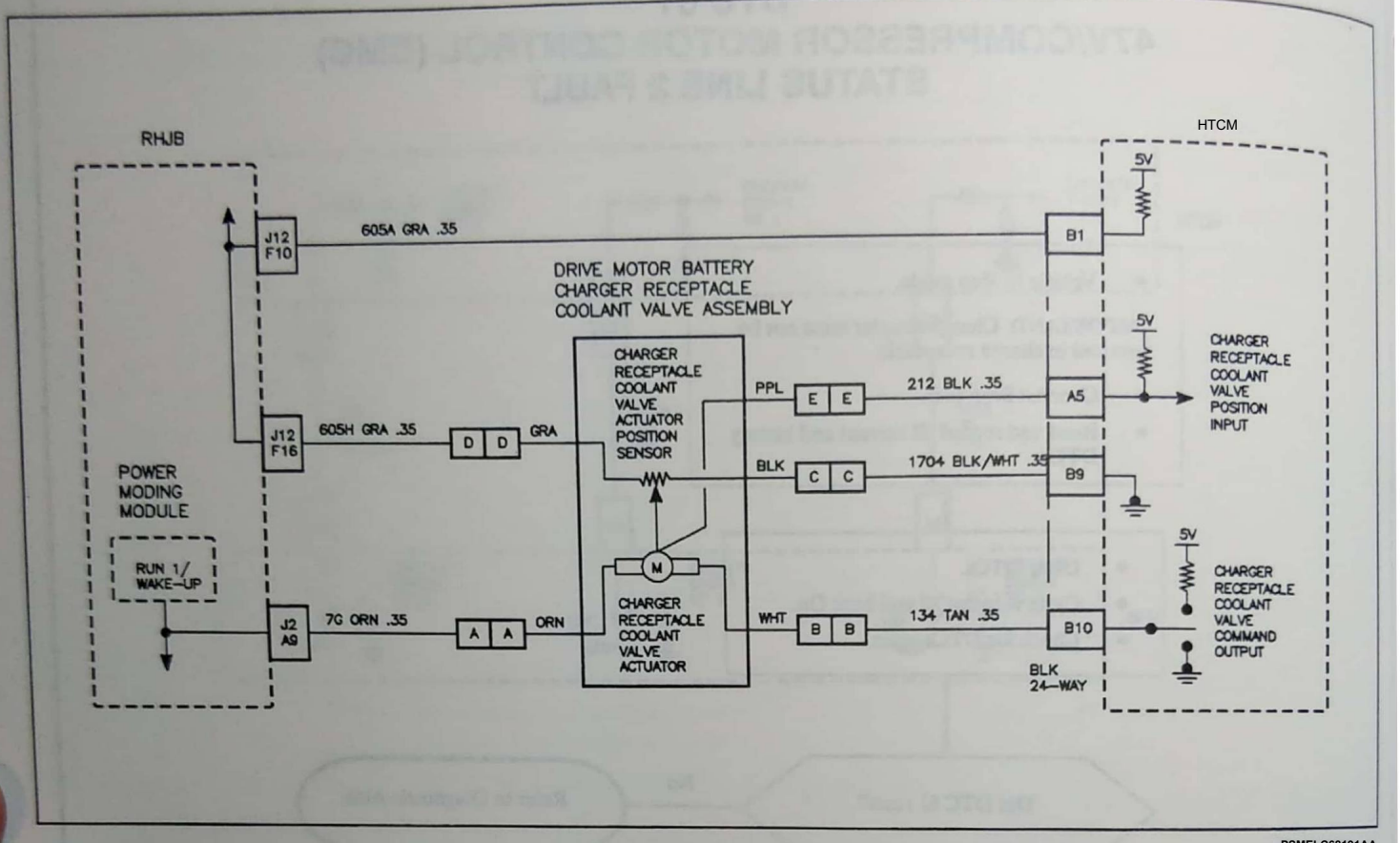
CamScanner

DTC 61
47V/COMPRESSOR MOTOR CONTROL (CMC)
STATUS LINE 2 FAULT


• Vehicle in Run mode.
IMPORTANT: Charge coupler must not be inserted in charge receptacle.
• Connect Scan tool.
• Read and record all current and history DTCs.
• Clear DTCs.
• Cycle vehicle Off and back On.
• Check for DTCs again.
Did DTC 61 reset?
No
Refer to Diagnostic Aids.
Yes
Disconnect APM connector - is pin 20 showing between 100k and 200k ohms to ground?
Yes
Replace accessory power module (APM).
No
• Check circuit 1063 for open or short to ground.
• If circuit ok, replace HTCM.

CamScanner

DTC 62 - CHARGER RECEPTACLE COOLANT VALVE (CRCV) FEEDBACK SHORT



PSMELC68191AA

CHARGER RECEPTACLE COOLANT VALVE (CRCV) FEEDBACK SHORT

The actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If a fault is detected on the feedback input circuit, this fault will be set.

DTC PARAMETERS

DTC 62 will set if:

- Short to ground in the charge port valve feedback circuit.
- Valve feedback circuit.
- Faulty charge port valve actuator.
- HTCM failure.

DTC 62 will set when:

Anytim. UTTMV 110 HTCM 1S awake - This fault exists if the HTCM detects less than 0.06 volts on the charge port valve feedback input circuit. H

FAILURE ACTION

TMs ?TC WJ11 be logged> and the SERVICE SOON telltale will be illuminated.

RELATED DTCS

HTCM 10,11,18, 22, 58

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

If the problem is intermittent, wiggle the wire harnesses while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 62
CHARGER RECEPTACLE COOLANT VALVE (CRCV) FEEDBACK SHORT

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history HTCM DTCs.

Are HTCM DTCs 10, 11, 18, 22, 58 and 62 set?

Yes → Go to Chart 10A.

No

Clear HTCM DTCs, then cycle vehicle Off and back On.

Does the DTC reset?

No → Problem is intermittent. Refer to Diagnostic Aids.

Yes

Backprobe HTCM 24 pin connector pin A5 - is there less than 0.15 volts in Run?

X. No → f Replace HTCM.]

Yes

Disconnect charger receptacle coolant valve connector. Is there still less than 0.06 volts at HTCM pin A5 in Run?

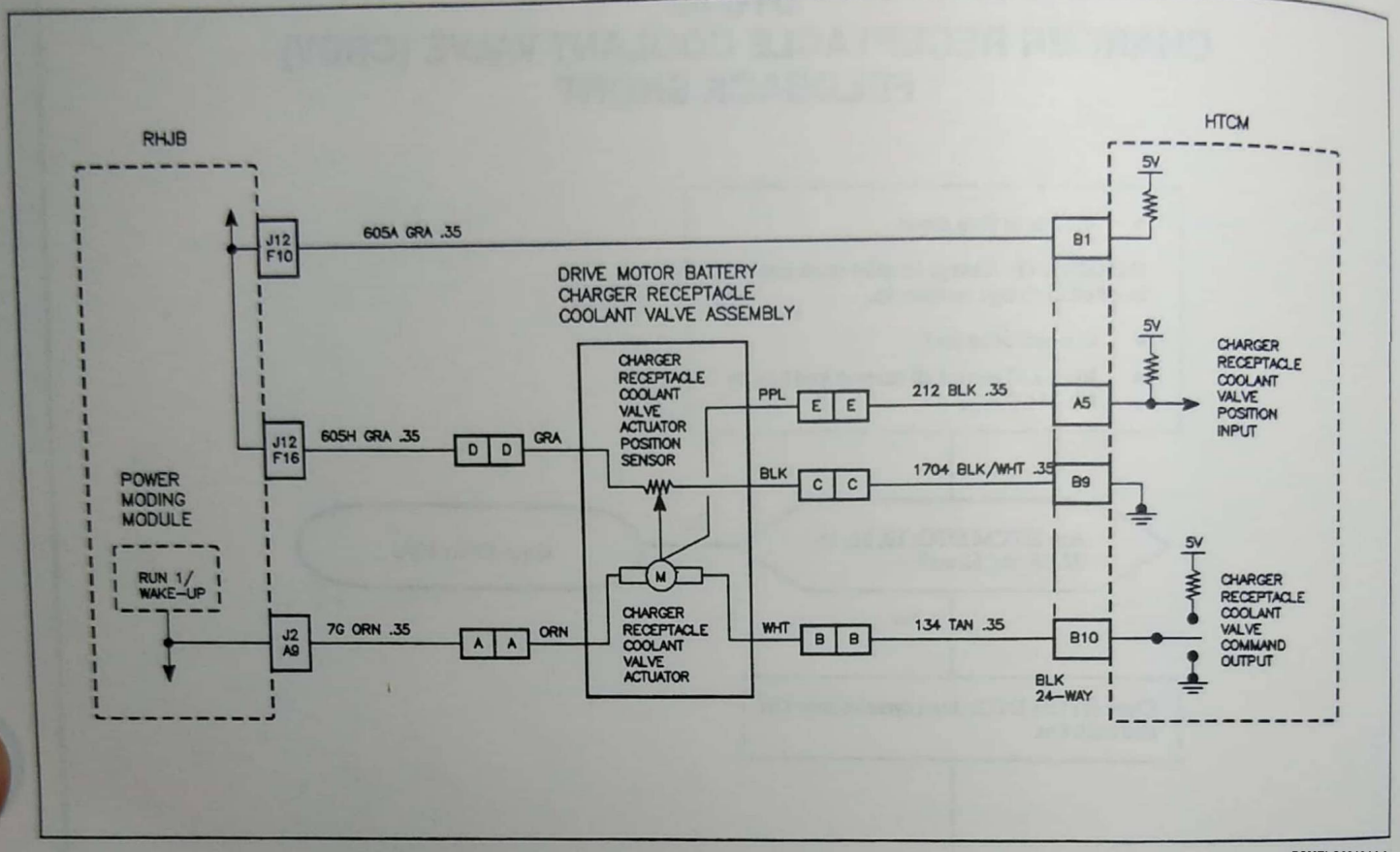
No → (Replace charger receptacle coolant valve.)

Yes

- Check for short to ground in circuit 212.
- If circuit ok, replace HTCM.

CamScanner

DTC 63 - CHARGER RECEPTACLE COOLANT VALVE (CRCV) FEEDBACK OUT OF RANGE



PSMELC68191AA

CHARGER RECEPTACLE COOLANT VALVE (CRCV) FEEDBACK OUT OF RANGE

The charge port valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. On power up after a loss of 12 volt power to the HTCM, the actuators are initialized by commanding travel to both positions. If the feedback indicates actuator travel out of range, this fault will be set.

DTC PARAMETERS

DTC 63 will set if:

- Charge port valve actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty charge port valve actuator.

DTC 63 will set when:

The first time the HTCM is awake, after losing 12 volt power. On this first power up, the HTCM will command the actuator first to the charge port position, then to the power electronics bay (PEB), while monitoring position feedback. This fault'exists if the HTCM detects less than 3.74 volts change between the two positions.

FAILURE ACTION

This DTC will be logged, and the SERVICE SOON telltale will be illuminated.

RELATED DTCS

HTCM 64

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire ^a^neSJ$_{eS}$ while viewing the Scan tool and see if the value chan$_{o}$ or the DTC sets.

CamScanner

DTC 63
CHARGER RECEPTACLE COOLANT VALVE (CRCXA FEEDBACK OUT OF RANGE

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history HTCM DTCs.

Is HTCM DTC 64 set? — Yes → Refer to HTCM DTC 64.

No

- Clear HTCM DTCs.
- Disconnect and reconnect HTCM.
- Cycle vehicle Off and back On.

Does DTC 63 reset? — No → C → Problem is intermittent. Refer to Diagnostic Aids.

Yes

- Put vehicle in Lock mode.
- Wait 15 seconds.
- Pull AUX battery maxifuse. Wait 20 seconds.
- Reinstall maxifuse. Wait one minute.
- Put vehicle back in Run mode.

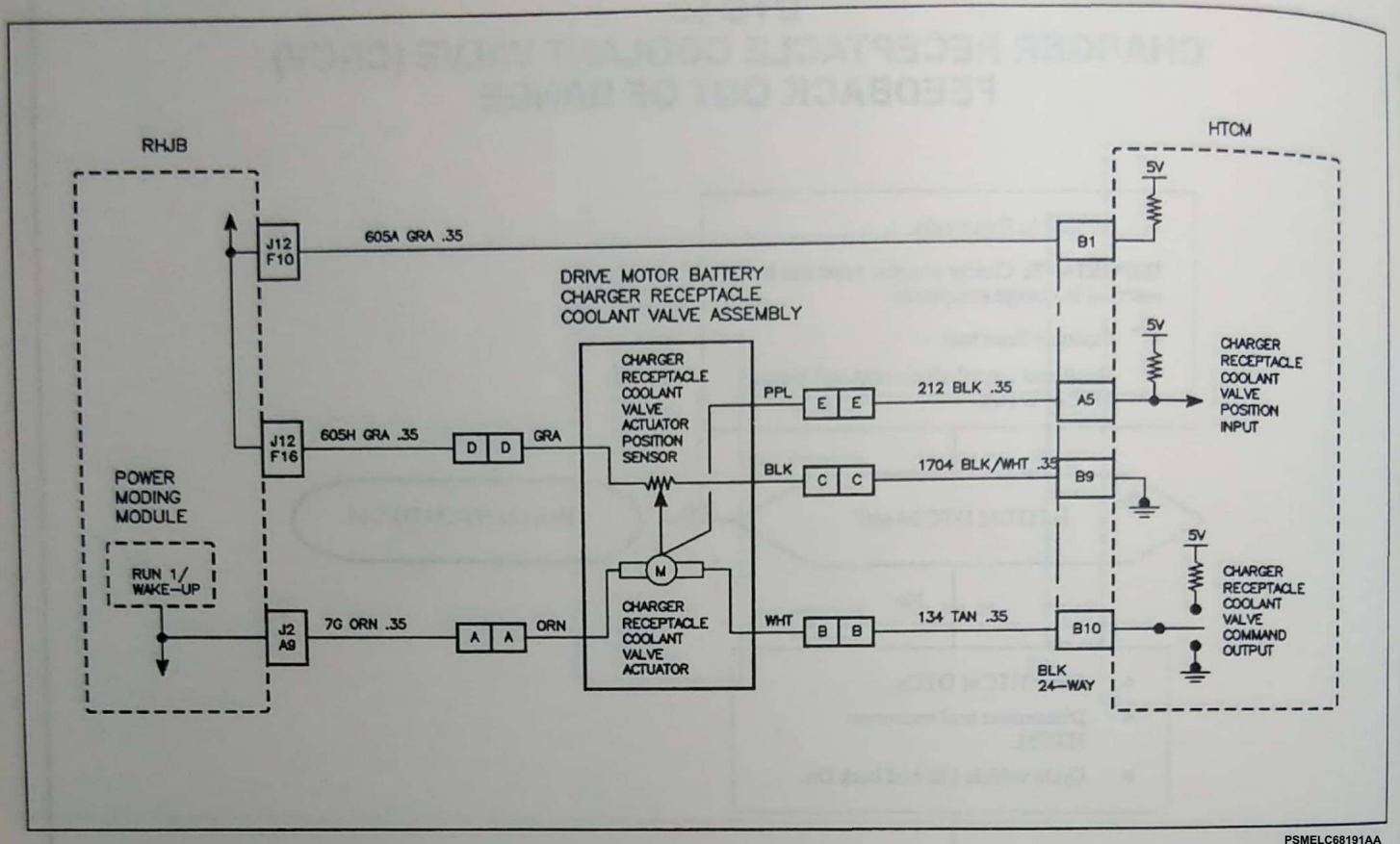
Does DTC 63 reset? — No → Vehicle operating normally.

Yes

C → Replace charger receptacle coolant valve.

CamScanner

DTC 64 - CHARGER RECEPTACLE COOLANT RECOVERY VALVE (CRCV) NOT RESPONDING



PSMELC68191AA

CHARGER RECEPTACLE COOLANT RECOVERY VALVE (CRCV) NOT RESPONDING

The charge port valve actuator position is monitored by the HPVS/thermal control module (HTCM) via a feedback circuit. If the feedback indicates that the actuator did not respond properly to a command, this fault will be set.

DTC PARAMETERS

DTC 64 will set if:

- Coolant valve actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty coolant valve actuator.
- Feedback circuit open/shorted.

DTC 64 will set when:

Anytime the coolant valve actuator feedback indicates that the actuator did not reach the commanded position.

FAILURE ACTION

This DTC will be logged, and the SERVICE SOON telltale will be illuminated.

RELATED DTCS

HTCM 62, 63

TELLTALE ILLUMINATED:

SERVICE SOON.

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire while viewing the Scan tool and see if the value c » or the DTC sets.

CamScanner

DTC 64

CHARGER RECEPTACLE COOLANT VALVE (CRCV) NOT RESPONDING

f Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

9 Connect Scan tool.

9 Read and record all current and history HTCM DTCs.

Is DTC 64 current?

No

- Clear HTCM DTCs.
- Install charge coupler, wait 15 seconds.
- Remove charge coupler, wait 15 seconds.

Yes

Does DTC 64 reset?

Yes

No Problem is intermittent. Refer to Diagnostic Aids.

Disconnect charge port coolant valve door. Is there over 4.8 volts on pin D of connector?

No

- Check for open in circuit 605 from charge port coolant valve door to RHJB.
- If circuit ok, replace RHJB.

Yes

Is there battery volts on pin A of connector?

No

- Check for open in circuit 7G from charge port coolant valve door to RHJB.
- If circuit ok, replace RHJB.

Yes

Is there 4.8 volts or pin E of connector?

No

- Check for open/short in circuit 212 from valve to HTCM.
- If circuit ok, replace HTCM.

Yes

Important: Put vehicle in Lock mode.

Is there less than five ohms to ground on pin C of connector?

No

- Check for open in circuit 1704 from charge port coolant valve door to HTCM.
- If circuit ok, replace HTCM.

Yes

Is pin B showing less than 3000 ohms to ground?

Yes

- Check for open in circuit 1704 from charge port coolant valve door to HTCM.
- If circuit ok, replace HTCM.

No

Is pin B showing over 7000 ohms to ground?

Yes

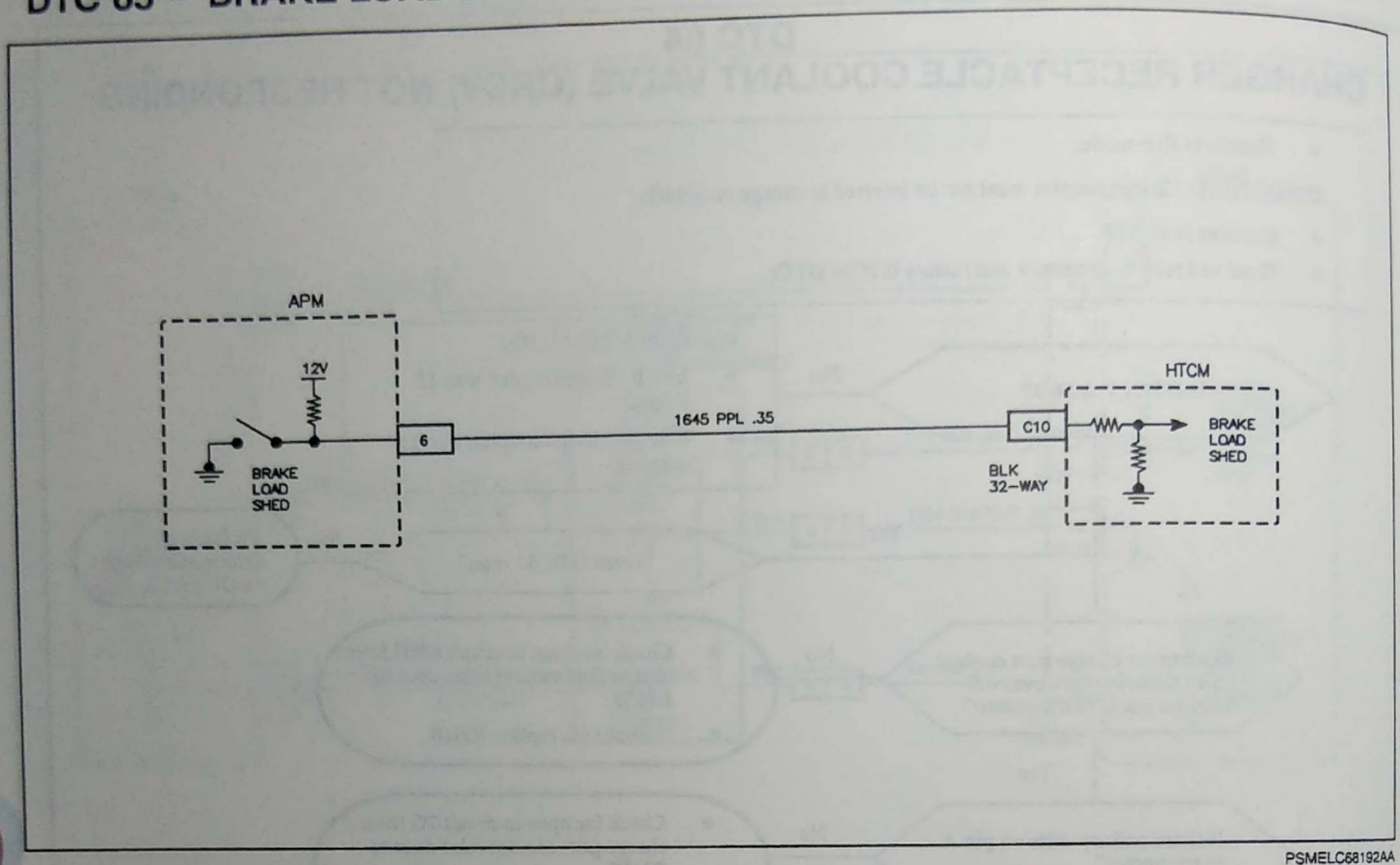
- Check for open in circuit 134 between HTCM and charge port coolant valve door.
- If circuit ok, replace HTCM.

No

Replace charge receptacle coolant valve door.

CamScanner

DTC 65 – BRAKE LOADSHED OCCURRED



BRAKE LOADSHED OCCURRED

If battery voltage falls below 10.5 volts during braking, the auxiliary power module (APM) will command the HPVS/thermal control module (HTCM) to perform load shed. When this occurs, the HTCM will momentarily turn off the rear defogger and the cabin blower in order to help ensure adequate power is available to the brake system. As soon as the brake is released or the auxiliary battery supply rises above 10.5 volts the load shed command is turned off. If a load shed situation occurs, this fault will be reported.

DTC PARAMETERS

DTC 65 will set if:

- Extreme operating conditions.
- Circuit 1645 open or shorted.
- APM fault.
- Auxiliary battery failure.

DTC 65 will set when:

Anytime the HTCM is awake and circuit 1645 is grounded.

FAILURE ACTION

This DTC will be logged, and the cabin blower and rear defogger will be momentarily disabled.

RELATED DTCS

HTCM 27, 38, 43

TELLTALE ILLUMINATED:

None

OTHER CONTROLLER INTERFACES

None

DIAGNOSTIC AIDS

Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing the Scan tool and see if the value changes or the DTC sets.

CamScanner

DTC 65
BRAKE LOADSHED OCCURRED

- Vehicle in Run mode.

IMPORTANT: Charge coupler must not be inserted in charge receptacle.

- Connect Scan tool.
- Read and record all current and history HTCM DTCs.

Are PCM DTCs set?

Yes → Diagnose PCM DTCs first.

No

Are HTCM DTCs 27 or 43 set?

Yes → Diagnose HTCM 27 or 43 first.

No

- Clear DTCs.
- Did DTC 65 reset?

No → Refer to Diagnostic Aids.

Yes

Disconnect HTCM connector - is connector pin C10 showing battery volts?

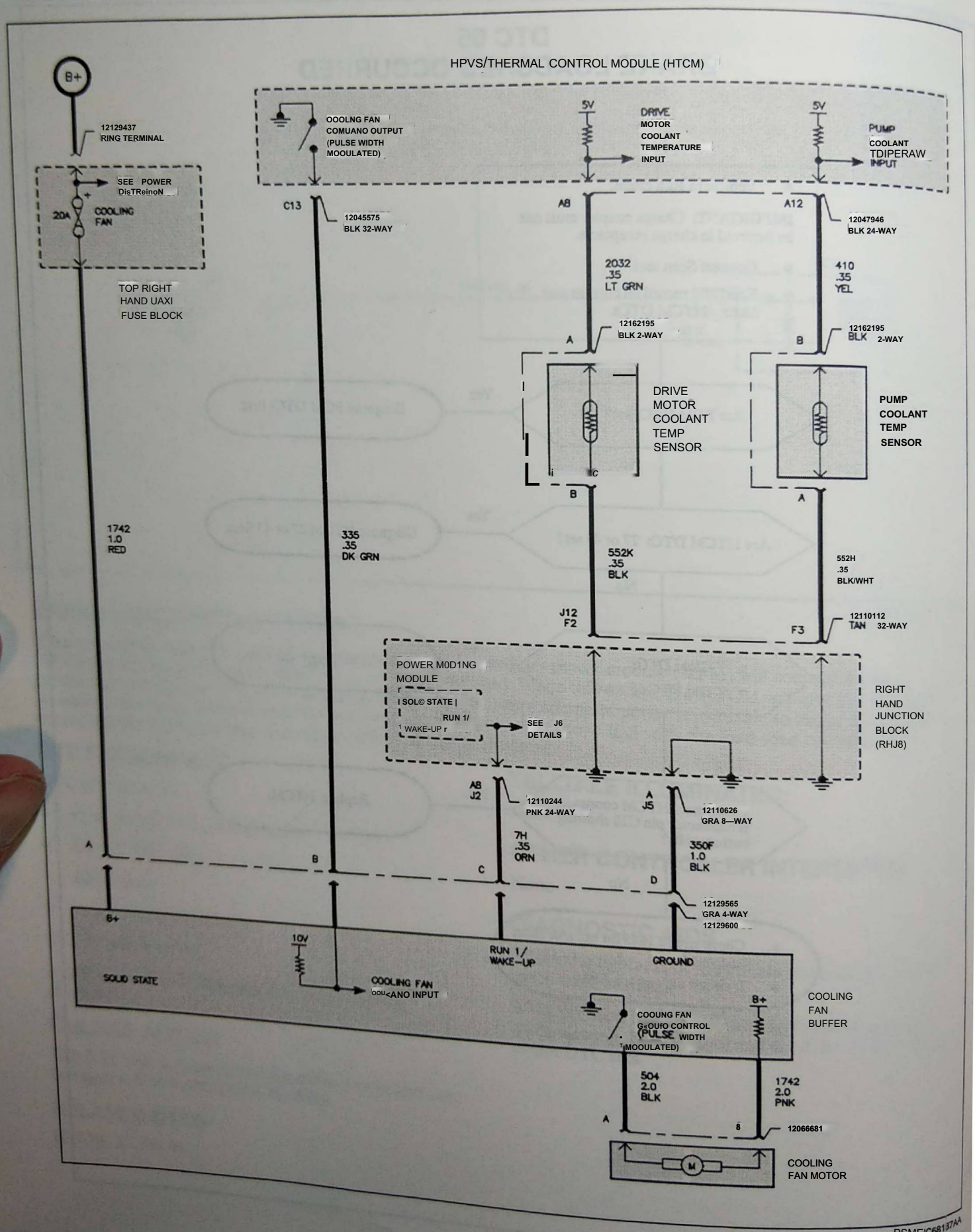
Yes → Replace HTCM.

No

- Check circuit 1645 for open or short to ground.
- If circuit ok, replace APM.

CamScanner

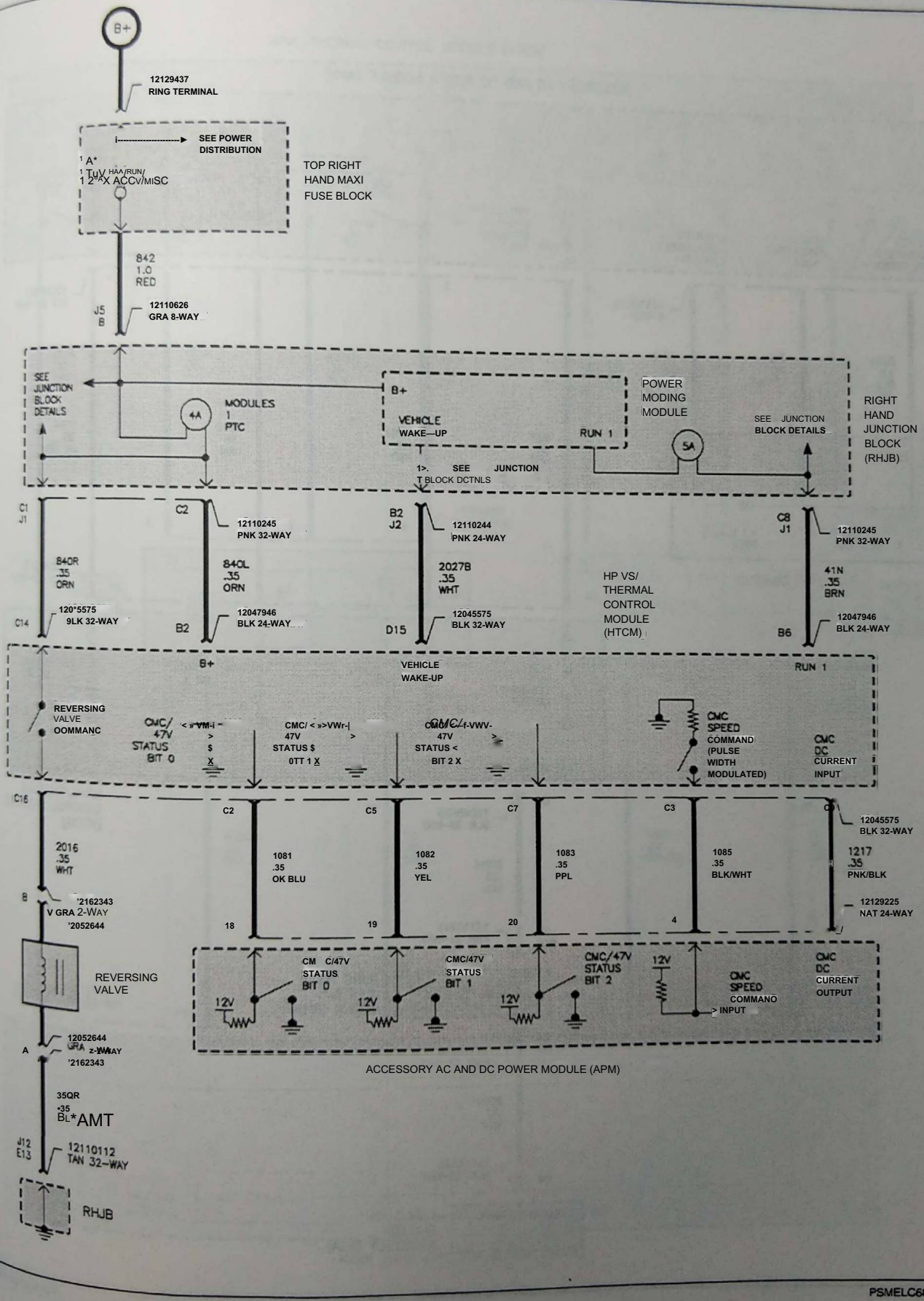
COOLING FAN

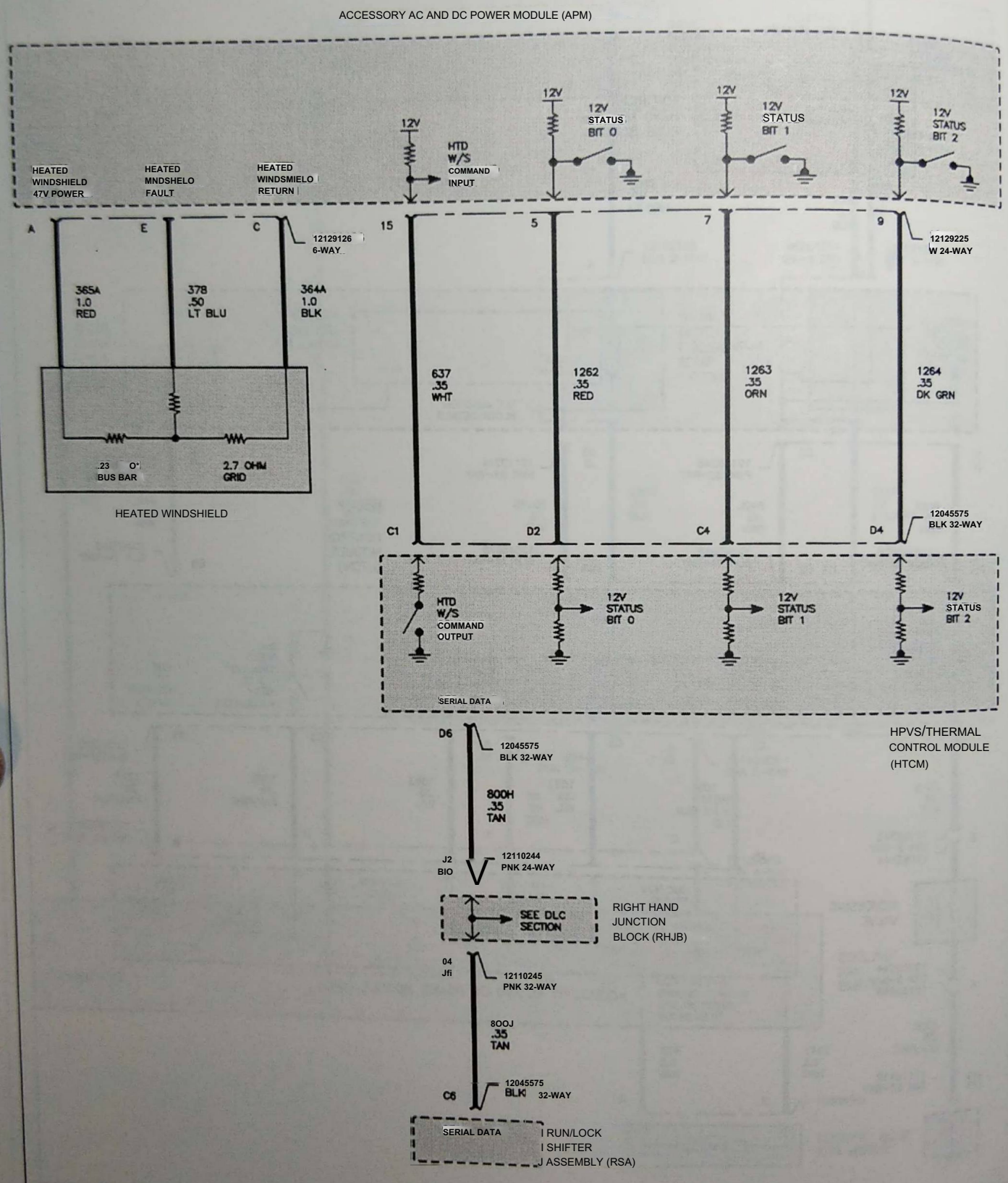


PSMEC68137AA

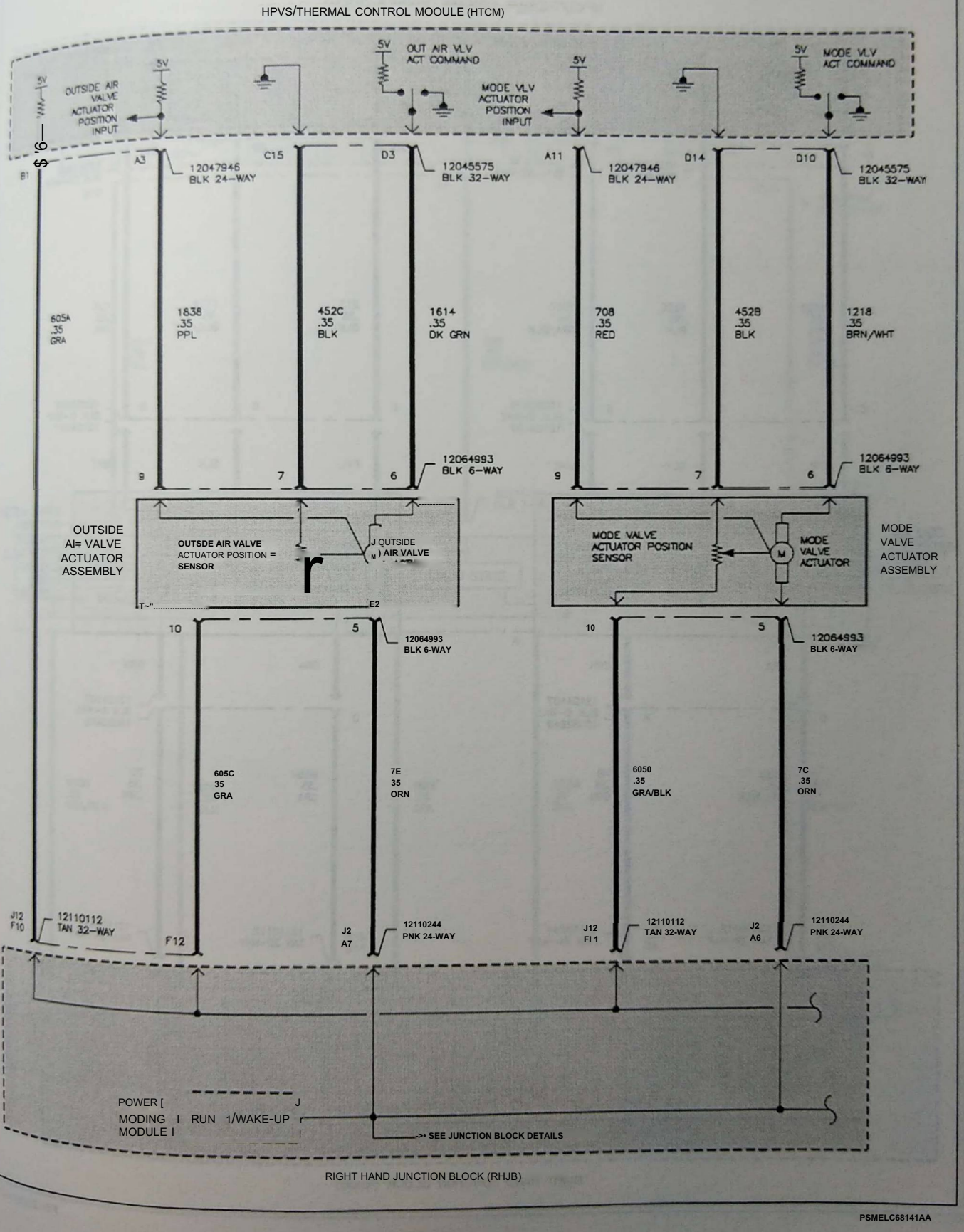
CamScanner

CLIMATE CONTROL

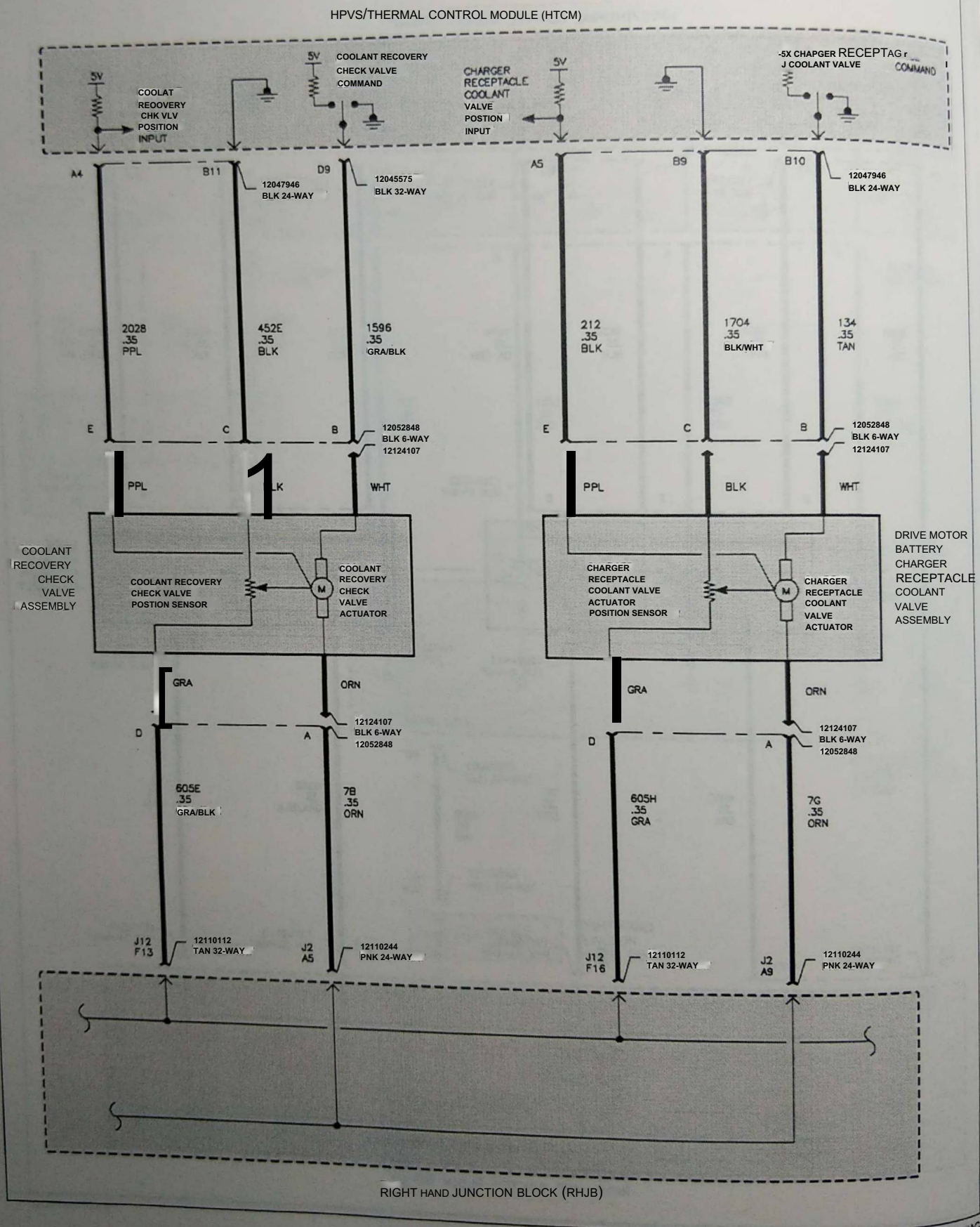



ACCESSORY AC AND DC POWER MODULE (APM)
HEATED WINDSHIELD 47V POWER
HEATED MNDSHELO FAULT
HEATED WINDSMIELO RETURN
12V
HTD W/S COMMAND INPUT
12V STATUS BIT 0
12V STATUS BIT 1
12V STATUS BIT 2
A
E
C
12129126 6-WAY
365A 1.0 RED
378 .50 LT BLU
364A 1.0 BLK
.23 O' BUS BAR
2.7 OHM GRID
HEATED WINDSHIELD
15
5
7
9
12129225 W 24-WAY
637 .35 WHT
1262 .35 RED
1263 .35 ORN
1264 .35 DK GRN
C1
D2
C4
D4
12045575 BLK 32-WAY
HTD W/S COMMAND OUTPUT
SERIAL DATA
HPVS/THERMAL CONTROL MODULE (HTCM)
D6
12045575 BLK 32-WAY
800H .35 TAN
J2 BIO
12110244 PNK 24-WAY
SEE DLC SECTION
RIGHT HAND JUNCTION BLOCK (RHJB)
04 Jfi
12110245 PNK 32-WAY
8OOJ .35 TAN
C6
12045575 BLK 32-WAY
SERIAL DATA
I RUN/LOCK
I SHIFTER
J ASSEMBLY (RSA)
PSMELC68138AA

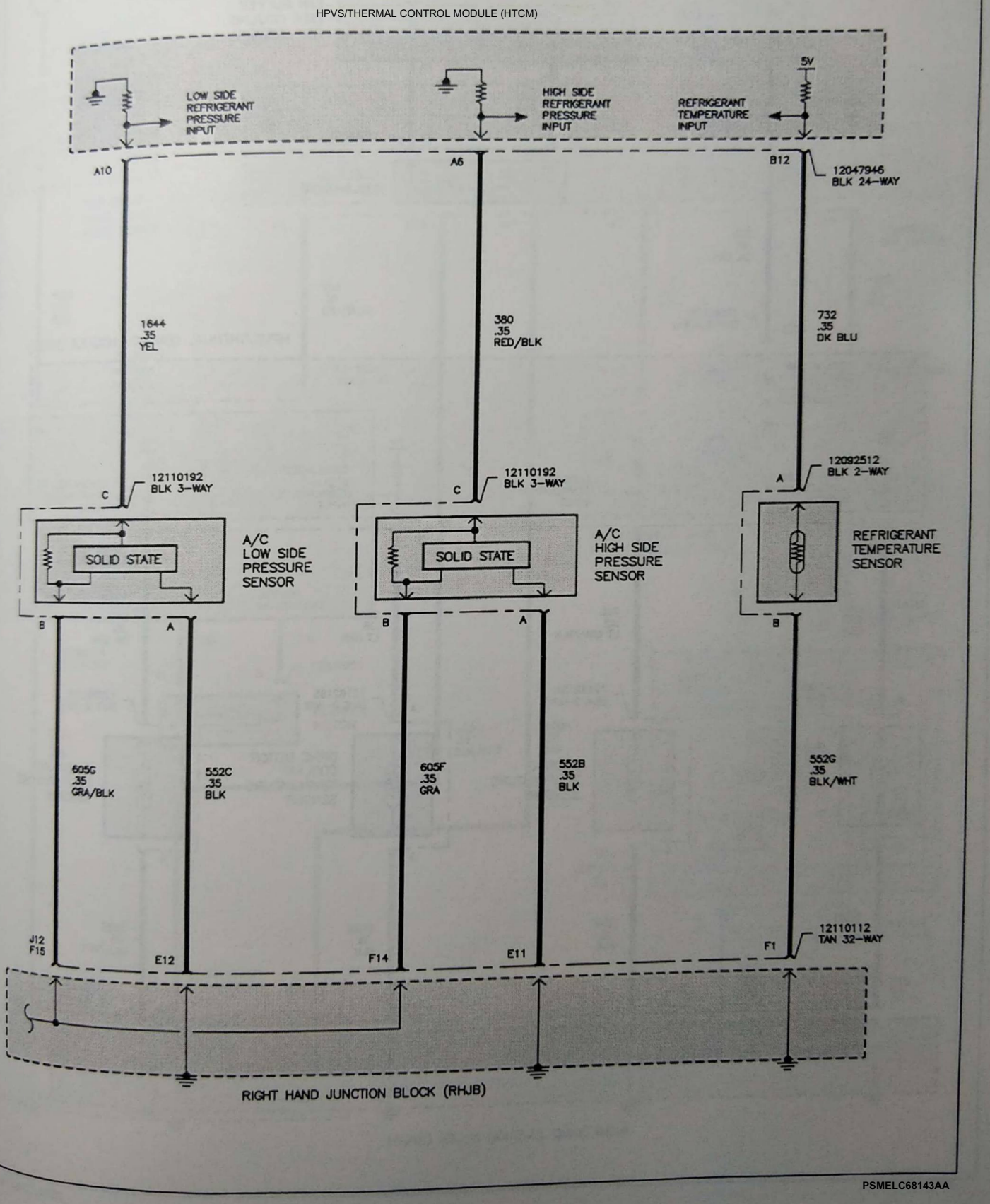
CamScanner


HPVS/THERMAL CONTROL MOOULE (HTCM)
5V
OUTSIDE AIR VALVE ACTUATOR POSITION INPUT
OUT AIR VLV ACT COMMAND
MODE VLV ACTUATOR POSITION INPUT
MODE VLV ACT COMMAND
A3
12047946 BLK 24-WAY
C15
D3
12045575 BLK 32-WAY
A11
D14
D10
605A .35 GRA
1838 .35 PPL
452C .35 BLK
1614 .35 DK GRN
708 .35 RED
4528 .35 BLK
1218 .35 BRN/WHT
12064993 BLK 6-WAY
OUTSIDE AI= VALVE ACTUATOR ASSEMBLY
OUTSDE AIR VALVE ACTUATOR POSITION = SENSOR
OUTSIDE AIR VALVE
MODE VALVE ACTUATOR POSITION SENSOR
MODE VALVE ACTUATOR
MODE VALVE ACTUATOR ASSEMBLY
E2
605C 35 GRA
7E 35 ORN
6050 .35 GRA/BLK
7C .35 ORN
J12 F10
12110112 TAN 32-WAY
F12
J2 A7
12110244 PNK 24-WAY
J12 FI 1
J2 A6
POWER [
MODING I
MODULE I
RUN 1/WAKE-UP
-> SEE JUNCTION BLOCK DETAILS
RIGHT HAND JUNCTION BLOCK (RHJB)
PSMELC68141AA

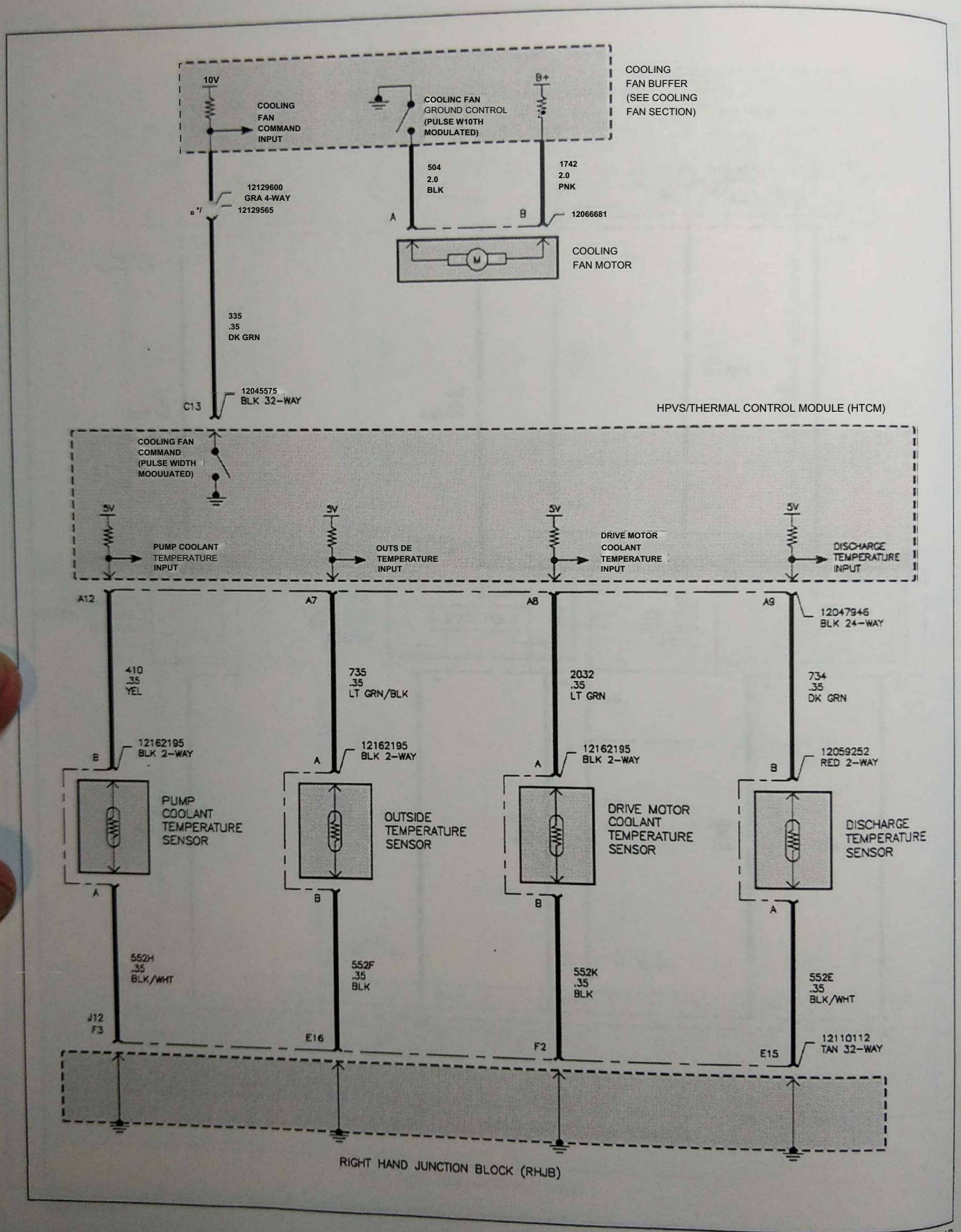
CamScanner


HPVS/THERMAL CONTROL MODULE (HTCM)
5V
COOLAT REOOVERY CHK VLV POSITION INPUT
5V
COOLANT RECOVERY CHECK VALVE COMMAND
CHARGER RECEPTACLE COOLANT VALVE POSTION INPUT
5V
-5X CHAPGER RECEPTAG r J COOLANT VALVE
COMMAND
A4
B11
D9
12047946 BLK 24-WAY
12045575 BLK 32-WAY
A5
B9
B10
12047946 BLK 24-WAY
2028 .35 PPL
452E .35 BLK
1596 .35 GRA/BLK
212 .35 BLK
1704 .35 BLK/WHT
134 .35 TAN
E
C
B
12052848 BLK 6-WAY 12124107
PPL
WHT
PPL
BLK
WHT
COOLANT RECOVERY CHECK VALVE ASSEMBLY
COOLANT RECOVERY CHECK VALVE POSTION SENSOR
M
COOLANT RECOVERY CHECK VALVE ACTUATOR
CHARGER RECEPTACLE COOLANT VALVE ACTUATOR POSITION SENSOR
M
CHARGER RECEPTACLE COOLANT VALVE ACTUATOR
DRIVE MOTOR BATTERY CHARGER RECEPTACLE COOLANT VALVE ASSEMBLY
GRA
ORN
D
A
12124107 BLK 6-WAY 12052848
605E .35 GRA/BLK
7B .35 ORN
605H .35 GRA
7G .35 ORN
J12 F13
12110112 TAN 32-WAY
J2 A5
12110244 PNK 24-WAY
J12 F16
J2 A9
RIGHT HAND JUNCTION BLOCK (RHJB)
PSMBLCW

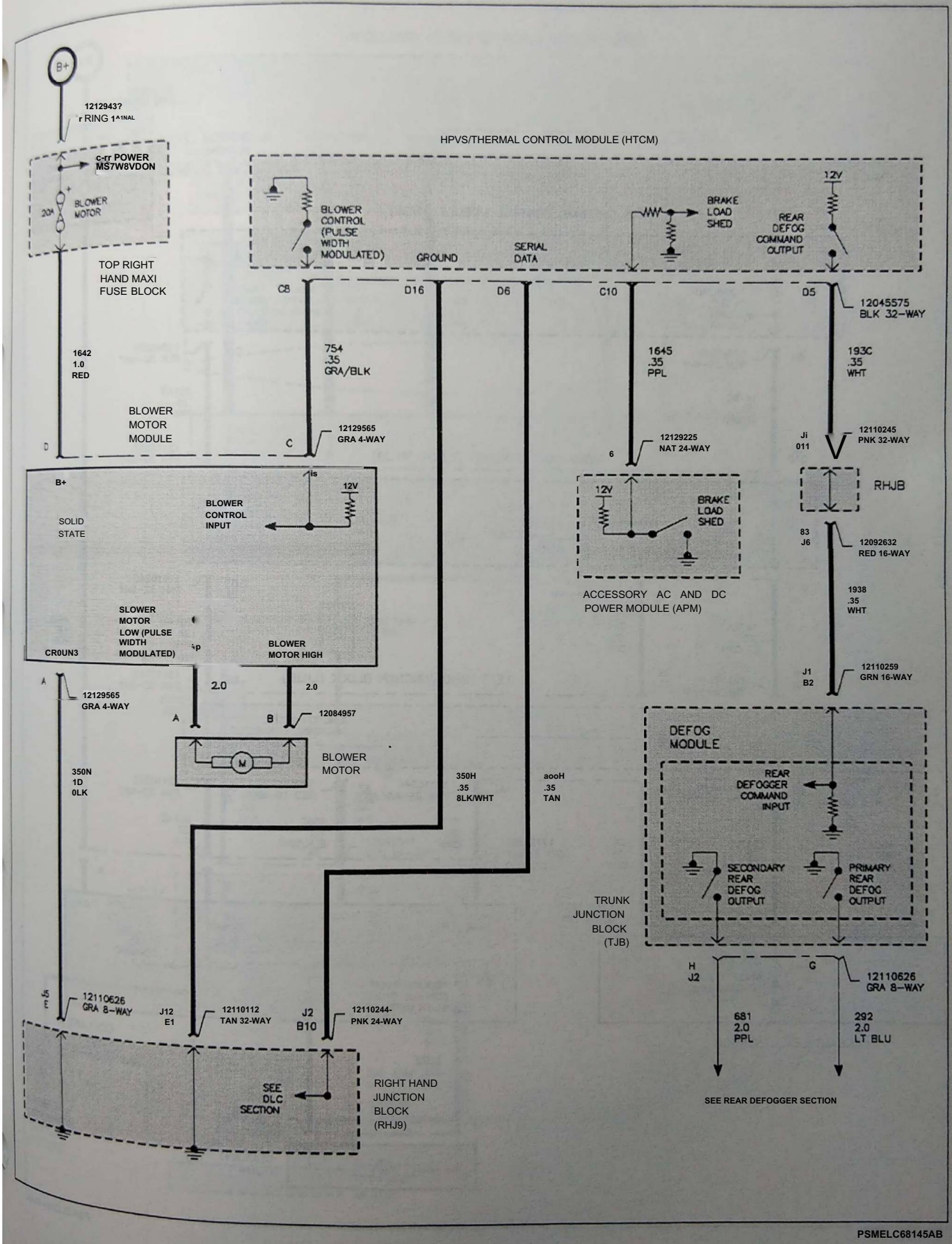
CamScanner


HPVS/THERMAL CONTROL MODULE (HTCM)
LOW SIDE REFRIGERANT PRESSURE INPUT
HIGH SIDE REFRIGERANT PRESSURE INPUT
REFRIGERANT TEMPERATURE INPUT
5V
A10
A6
B12
12047946 BLK 24-WAY
1644 .35 YEL
380 .35 RED/BLK
732 .35 DK BLU
12110192 BLK 3-WAY
12110192 BLK 3-WAY
12092512 BLK 2-WAY
SOLID STATE
A/C LOW SIDE PRESSURE SENSOR
SOLID STATE
A/C HIGH SIDE PRESSURE SENSOR
REFRIGERANT TEMPERATURE SENSOR
605G .35 GRA/BLK
552C .35 BLK
605F .35 GRA
552B .35 BLK
552G .35 BLK/WHT
J12 F15
E12
F14
E11
F1
12110112 TAN 32-WAY
RIGHT HAND JUNCTION BLOCK (RHJB)
PSMELC68143AA

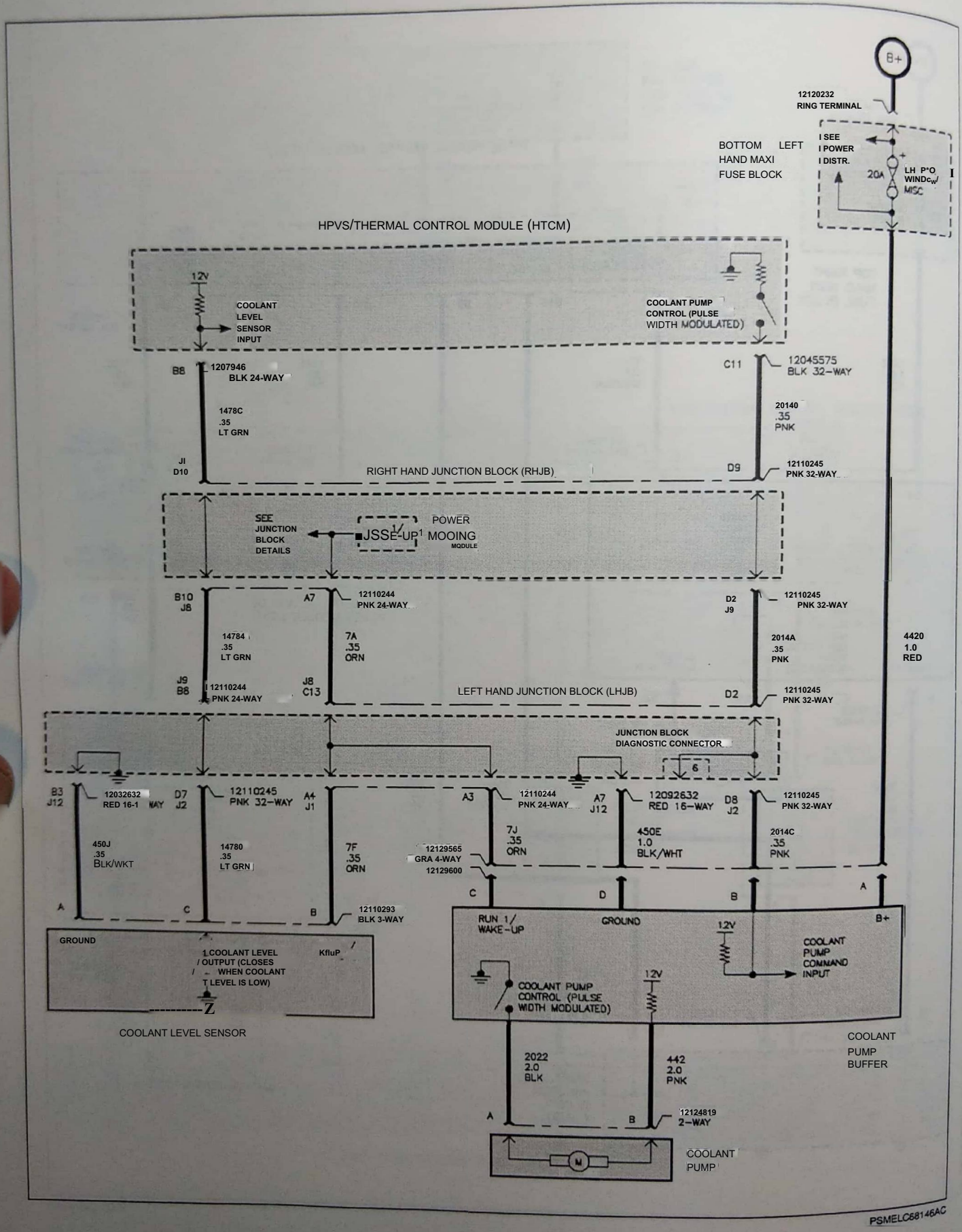
CamScanner


COOLING FAN BUFFER (SEE COOLING FAN SECTION)
10V
COOLING FAN COMMAND INPUT
COOLINC FAN GROUND CONTROL (PULSE W10TH MODULATED)
B+
504 2.0 BLK
1742 2.0 PNK
12129600 GRA 4-WAY
12129565
12066681
COOLING FAN MOTOR
335 .35 DK GRN
C13
12045575 BLK 32-WAY
HPVS/THERMAL CONTROL MODULE (HTCM)
COOLING FAN COMMAND (PULSE WIDTH MOOUUATED)
5V
PUMP COOLANT TEMPERATURE INPUT
OUTS DE TEMPERATURE INPUT
DRIVE MOTOR COOLANT TEMPERATURE INPUT
DISCHARGE TEMPERATURE INPUT
A12
A7
A8
A9
12047946 BLK 24-WAY
410 .35 YEL
735 .35 LT GRN/BLK
2032 .35 LT GRN
734 .35 DK GRN
12162195 BLK 2-WAY
12162195 BLK 2-WAY
12162195 BLK 2-WAY
12059252 RED 2-WAY
PUMP COOLANT TEMPERATURE SENSOR
OUTSIDE TEMPERATURE SENSOR
DRIVE MOTOR COOLANT TEMPERATURE SENSOR
DISCHARGE TEMPERATURE SENSOR
552H .35 BLK/WHT
552F .35 BLK
552K .35 BLK
552E .35 BLK/WHT
J12 F3
E16
F2
E15
12110112 TAN 32-WAY
RIGHT HAND JUNCTION BLOCK (RHJB)
PSMELC68144AB

CamScanner


B+
12129432
RING 1 FINAL
C-RT POWER
MS7W8VDON
20A
BLOWER MOTOR
TOP RIGHT HAND MAXI FUSE BLOCK
1642
1.0
RED
D
BLOWER MOTOR MODULE
C
12129565
GRA 4-WAY
HPVS/THERMAL CONTROL MODULE (HTCM)
BLOWER CONTROL (PULSE WIDTH MODULATED)
GROUND
SERIAL DATA
BRAKE LOAD SHED
REAR DEFOG COMMAND OUTPUT
12V
C8
D16
D6
C10
D5
754
.35
GRA/BLK
1645
.35
PPL
193C
.35
WHT
12045575
BLK 32-WAY
6
12129225
NAT 24-WAY
Ji
011
12110245
PNK 32-WAY
B+
SOLID STATE
BLOWER CONTROL INPUT
12V
SLOWER MOTOR
LOW (PULSE WIDTH MODULATED)
CR0UN3
BLOWER MOTOR HIGH
ACCESSORY AC AND DC POWER MODULE (APM)
12V
BRAKE LOAD SHED
RHJB
83
J6
12092632
RED 16-WAY
1938
.35
WHT
J1
B2
12110259
GRN 16-WAY
A
12129565
GRA 4-WAY
2.0
2.0
A
B
12084957
M
BLOWER MOTOR
DEFOG MODULE
REAR DEFOGGER COMMAND INPUT
SECONDARY REAR DEFOG OUTPUT
PRIMARY REAR DEFOG OUTPUT
TRUNK JUNCTION BLOCK (TJB)
350N
1D
0LK
350H
.35
8LK/WHT
aooH
.35
TAN
H
J2
G
12110626
GRA 8-WAY
681
2.0
PPL
292
2.0
LT BLU
SEE REAR DEFOGGER SECTION
J5
12110626
GRA 8-WAY
J12
E1
12110112
TAN 32-WAY
J2
B10
12110244-
PNK 24-WAY
SEE DLC SECTION
RIGHT HAND JUNCTION BLOCK (RHJ9)
PSMELC68145AB

CamScanner


B+
12120232
RING TERMINAL
BOTTOM LEFT HAND MAXI FUSE BLOCK
I SEE I POWER I DISTR.
20A
LH P*O WINDc,/ MISC
HPVS/THERMAL CONTROL MODULE (HTCM)
12V
COOLANT LEVEL SENSOR INPUT
COOLANT PUMP CONTROL (PULSE WIDTH MODULATED)
B8
1207946
BLK 24-WAY
1478C .35 LT GRN
JI D10
RIGHT HAND JUNCTION BLOCK (RHJB)
C11
12045575
BLK 32-WAY
20140 .35 PNK
D9
12110245
PNK 32-WAY
SEE JUNCTION BLOCK DETAILS
JSSE-UP
POWER MOOING MODULE
B10 J8
A7
12110244
PNK 24-WAY
14784 .35 LT GRN
7A .35 ORN
J9 B8
J8 C13
12110244
PNK 24-WAY
LEFT HAND JUNCTION BLOCK (LHJB)
D2 J9
12110245
PNK 32-WAY
2014A .35 PNK
4420 1.0 RED
D2
12110245
PNK 32-WAY
JUNCTION BLOCK DIAGNOSTIC CONNECTOR
B3 J12
12032632
RED 16-1 WAY
D7 J2
12110245
PNK 32-WAY
A4 J1
450J .35 BLK/WKT
14780 .35 LT GRN
7F .35 ORN
A3
12110244
PNK 24-WAY
7J .35 ORN
12129565
GRA 4-WAY
12129600
A7 J12
12092632
RED 16-WAY
450E 1.0 BLK/WHT
D8 J2
12110245
PNK 32-WAY
2014C .35 PNK
A
C
B
12110293
BLK 3-WAY
C
D
B
A
RUN 1/ WAKE-UP
GROUND
B+
12V
COOLANT PUMP COMMAND INPUT
COOLANT PUMP CONTROL (PULSE WIDTH MODULATED)
12V
GROUND
COOLANT LEVEL / OUTPUT (CLOSES WHEN COOLANT LEVEL IS LOW)
KfluP
Z
COOLANT LEVEL SENSOR
COOLANT PUMP BUFFER
2022 2.0 BLK
442 2.0 PNK
A
B
12124819
2-WAY
M
COOLANT PUMP
PSMELC68146AC

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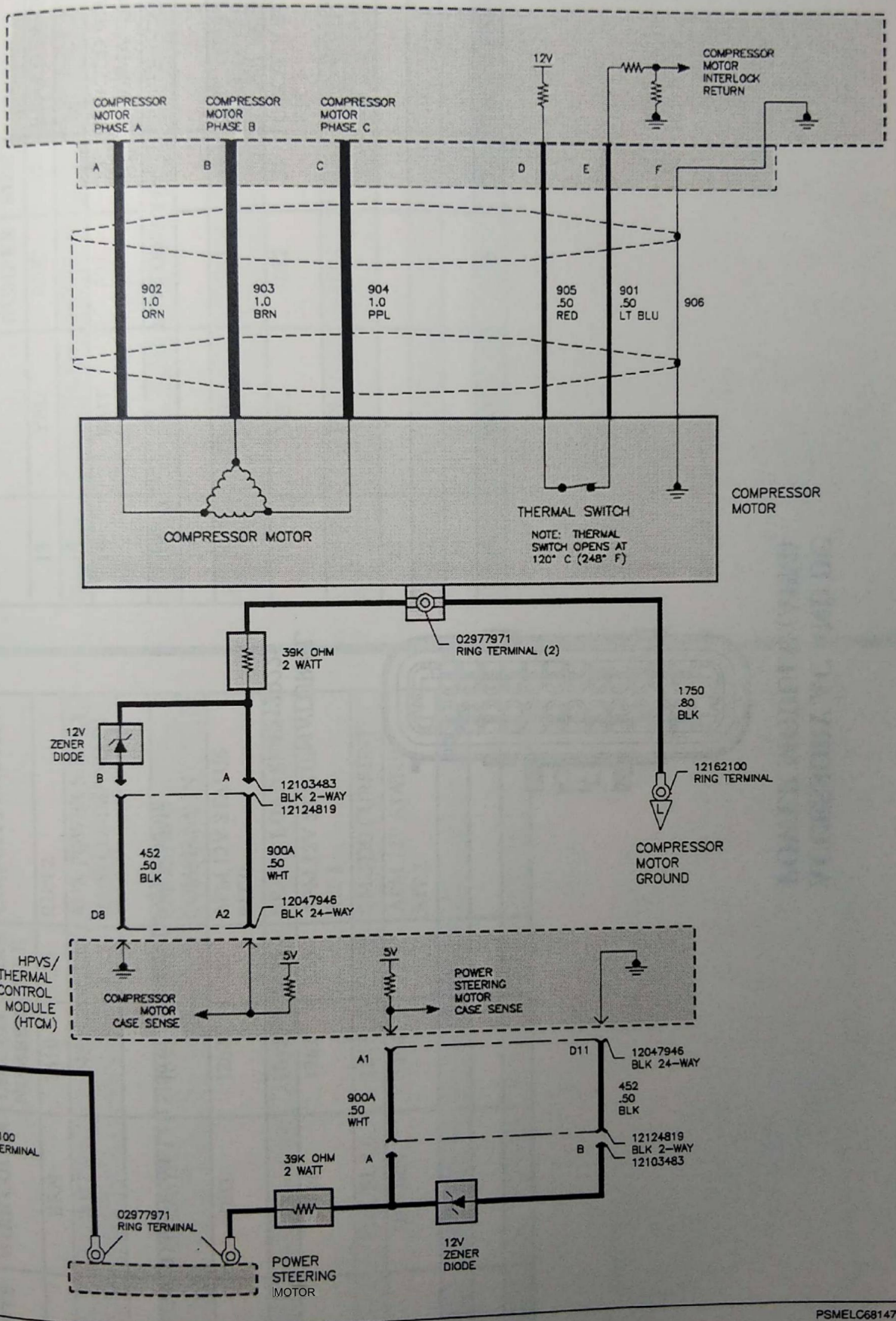
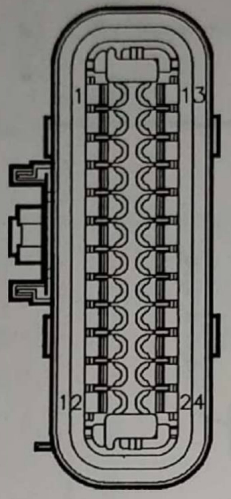
ACCESSORY AC AND DC POWER MODULE (APM)



PSMELC68147AB

CamScanner

ACCESSORY AC AND DC POWER MODULE (APM)



NATURAL
12129225

Location: Underhood, Left Side of Accessory Power Module

PSMELC67235AA

CamScanner

ACCESSORY AC ANI) DC POWER MODULE - 12129225

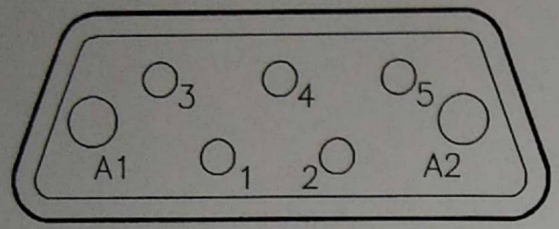
/ CAVITY	WIRE COLOR	CIRCUIT NUMBER	/ WIRE SIZE	CIRCUIT FUNCTION
1	BRN	24IB	.35	RUN 2
2	WHT	249	.35	AUX POWER SUPPLY (APS) COMMAND IN
3				
4	BLK/WHT	1085	.35	CMC SPEED COMMAND IN
5	RED	1262	.35	APM 12V STATUS BITO
6	PPL	1645	.35	BRAKE LOAD SHED
7	ORN	1263	.35	APM 12V STATUS BIT 1
8	PNK/BLK	1217	.35	CMC DC CURRENT
9	DRGRN	1264	.35	APM 12V STATUS BIT 2
10				
11				
12				

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
13	YEL	820C	.35	BRAKE SWITCH IN
14				
15	WHT	637	.35	HEATED W/S COMMAND IN
16				
17				
18	DKBLU	1081	.35	CMC/47V STATUS BITO
19	YEL	1082	.35	CMC/47V STATUS BIT I
20	PPL	1083	.35	CMC/47V STATUS BIT 2
21				
22				
23				
24	WHT	2027C	.35	VEHICLE WAKE-UP

CamScanner

HARNESS CONNECTOR FACES

ACCESSORY POWER MODULE (APM)



BLINDMATE

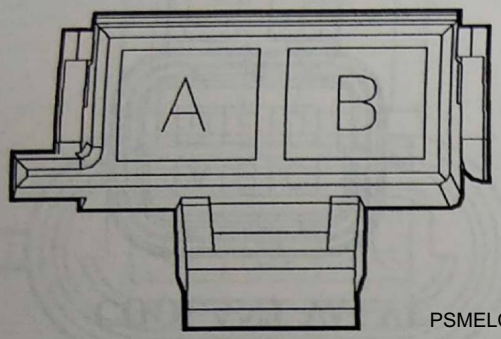
PSMELC68244AA

ACCESSORY POWER MODULE (APM)				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A1				HV BATT +
1				HV INTERLOCK RETURN -
2				
3				
4				
5				HV INTERLOCK +
A2				HV BATT-

Location: Underhood, Attached to Lower Left of Power Electronics Bay

CamScanner

BATTERY RECOVERY SWITCH (BRS)



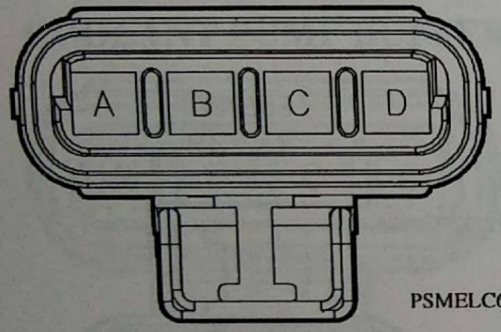
PSMELC67223AA

GRAY
12034341

BATTERY RECOVERY SWI TCH - 12034341				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE \ SIZE 1	CIRCUIT FUNCTION \
A	WHT	26C	.35	AD POWER SUPPLY \
B	WHT	2027E	1 .22	VEHICLE WAKE-UP \

Location: Passenger Compartment, Under Right Side of I/P

BLOWER MOTOR MODULE



PSMELC67176AA

DARK GREY
12129565

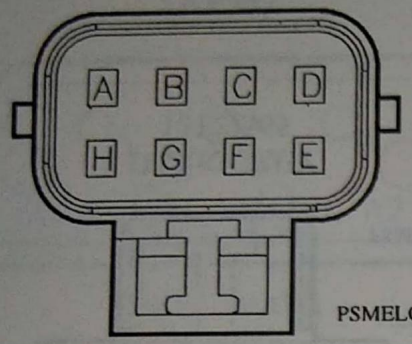
BLOWER MOTOR MODULE - 12129565				
CAVITY	WIRECOLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK	350N	1.0	GROUND
B				
C	GRA/BLK	754	.35	BLOWER CONTROL IN
D	RED	1642	1.0	B+

Location: Passenger Compartment, In Heat Pump Ventilation Module Under Right Side of I/P

CamScanner

HARNESS CONNECTOR FACES

CHARGER RECEPTACLE



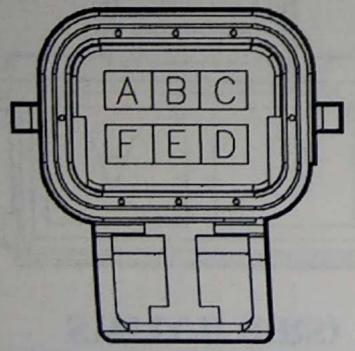
PSMELC67217AA

BLACK
12047937

CHARGER RECEPTACLE - 12047937				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	ORN	2740	.35	CHARGER COUPLER PRESENT SWITCH B+
B	DKGRN	2023	.35	CHARGER COUPLER PRESENT SWITCH OUT
c	PPL	1807E	.35	CLASS 2 DATA
D	PNK	2I3C	.35	CHARGER RECEP-TACLE TEMP SEN-SOR HI
E	BLK	450EE	.35	GROUND
F				
G	WHT	2027G	.35	VEHICLE WAKE-UP
H	BLK	450H	.35	GROUND

Location: Front of Vehicle, Near Charge Reccptical

CHARGER RECEPTACLE COOLANT VALVE



PSMELC672I5AA

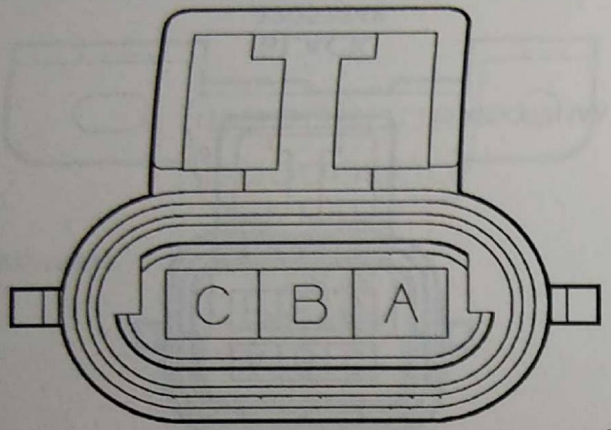
BLACK
\2052H4H

CHARGER RECEPTACLE COOLANT VALVE - 12052848				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	ORN	7G	.35	RUN 1/WAKE-UP
B	TAN	134	.35	VALVE COMMAND IN
C	BLK/WHT	1704	.35	GROUND
D	GRA	605H	.35	+5V REF IN
E	BLK	212	.35	VALVE POSITION OUT
F				

Location: Left Front, Attached to Midrail

CamScanner

COOLANT LEVEL SENSOR



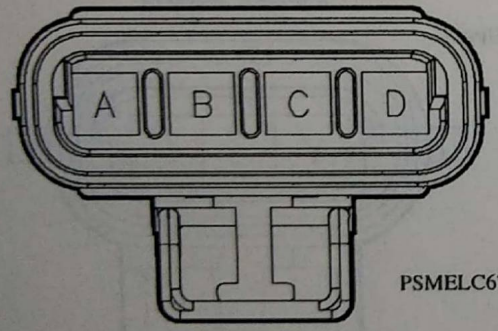
PSMELC66039AA

BLACK
12110293

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK / WHT	450J	35	GROUND
B	ORN	7F	35	RUN 1/WAKE-UP
C	LTGRN	1478B	.35	COOLANTLEVEL OUT

Location: Undcrhood, Below Coolant Expansion Tank

COOLANT PUMP BUFFER



PSMELC67176AA

DARK GRAY
12129565

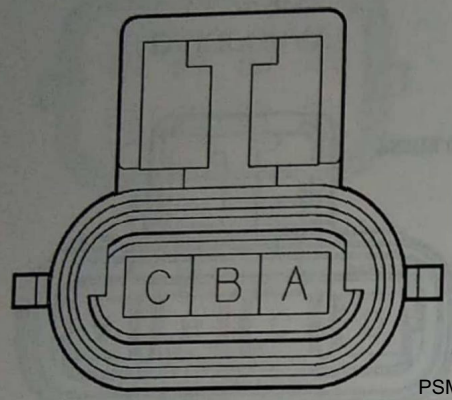
COOLANT PUMP BUFFER - 12129565				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	RED	442B	1.0	B+
B	PNK	20I4C	35	COOLANT PUMP COMMAND IN
C	ORN	7J	35	RUN 1
D	BLKAVHT	450E	1.0	GROUND

Location: Left Front, Attached to Midrail

CamScanner

HARNESS CONNECTOR FACES

COOLANT PUMP TEMPERATURE SENSOR



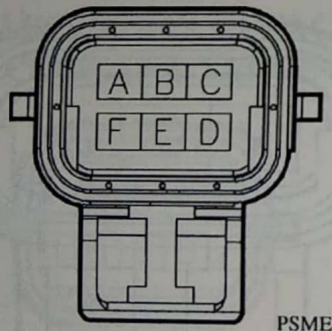
PSMELC66039AA

DARK GRAY
12129565

CUULARIfun TEMPERATURE SENSOR - 12129565				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK/WHT	552H	.35	GROUND
B	YEL	410	.35	SENSOR HI

Location: Underhood, At Base of Coolant Pump

COOLANT RECOVERY CHECK VALVE



PSMELC67215AA

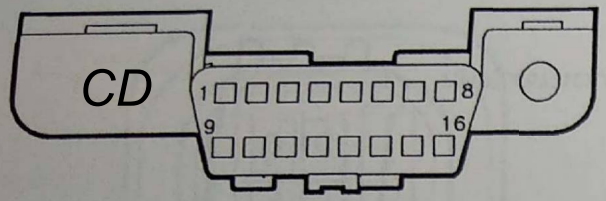
BLACK
12052848

COOLANT RECOVERY CHECK VALVE - 12052848				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	ORN	7B	.35	RUN 1 / WAKE-UP
B	GRA/BLK	1596	.35	VALVE COMMAND IN
C	BLK	452E	.35	GROUND
D	LTBLU/BLK	605E	.35	+5V REF IN
E	PPL	2028	.35	VALVE POSITION OUT
F				

Location: Right Front Attached to Midrail

CamScanner

DATA LINK CONNECTOR (DEC)



PSMELC67259AA

GRAY
12110250

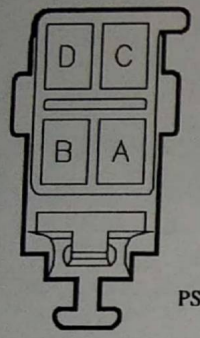
DATA EINK CONNECTOR - 12110250				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE \ SIZE	CIRCUIT FUNCTION \
1				
2	PPL	1807C	.35	CLASS 2 DATA
3				
4	BLK	450N	.35	GROUND
5	BLK	450T	.35	GROUND
6				
7				
8				
9	TAN	SOOL	.35	SERIAL DATA
10				
11				
12				
13				
14				
15				
L 16	ORN	1640	.35	B+

Location: Passenger Compartment, Under Lower Left of I/P

CamScanner

HARNESS CONNECTOR FACES

DEFOGGER AND BATTERY PACK FAN INLINE - FEMALE CONNECTOR



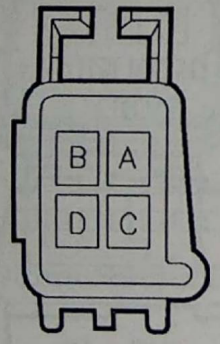
PSMELC67252AA

BLACK
12129136

DEFOGGER AND BATTERY PACK FAN INLINE - 12129136				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	RED	**1242A**	**1.0**	PRIMARY DEFOG B+
B	RED	**1342A**	**1.0**	SECONDARY DEFOG B+
C	RED	**1142B**	**1.0**	BATTERY PACK FAN MOTOR B+
D				

Location: Passenger Compartment, Right Side of I/P Above Junction Block

DEFOGGER AND BATTERY PACK FAN INLINE - MALE CONNECTOR



PSMELC672I0AA

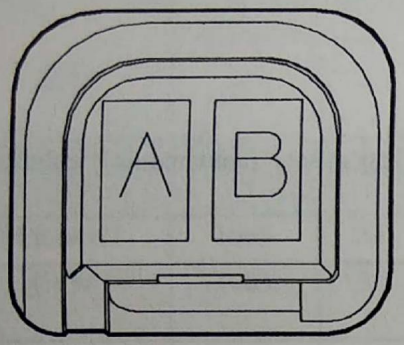
BLACK
12129135

DEFOGGER AND BATTERY PACK FAN INLINE - 12129135				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	RED	1242B	2.0	PRIMARY DEFOG B+
B	RED	1342B	3.0	SECONDARY DEFOG **B+**
C	RED	1142C	3.0	BATTERY PACK FAN MOTOR B+
D				

Location: Passenger Compartment, Right Side of I/P Above Junction Block

CamScanner

DISCHARGE TEMPERATURE SENSOR



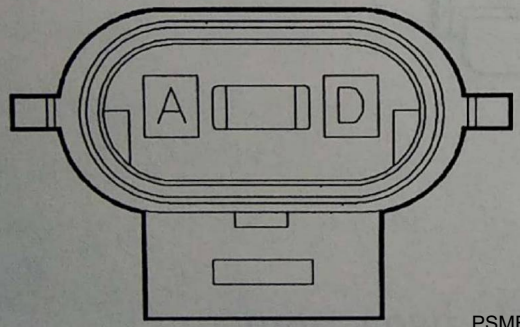
PSMELC67240AA

RED
12059252

DISCHARGE TEMPERATURE SENSOR - 12059252				
1 CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
A	GRA	552E	35	GROUND
B	DK GRN	734	35	DISCHARGE TEMP | SENSOR OUR

Location: Passenger Compartment, Inside HVAC Module

DRIVER DOOR JAMB SWITCH



PSMELC67199A A

BLACK
12110196

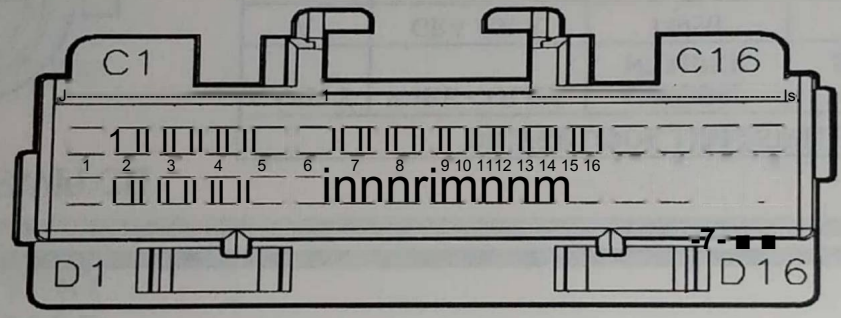
DRIVER DOOR JAMB SWITCH - 12110196				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	GRA/BLK	1495B	35	SWITCH HI
D	BLK	**450L**	35	GROUND

Location: Driver Door, Part of Latch Assembly

CamScanner

HARNESS CONNECTOR FACES

HEAT PUMP VENTILATION SYSTEM/THERMAL CONTROL MODULE (HTCM)



BLACK

12045575

Location: Passenger Compartment, Lower Right Side of I/P

PSMELC67247AA

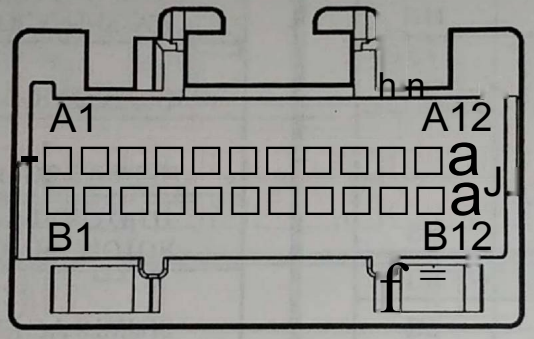
CamScanner

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Cl	WHT	637	.35	HEATED W/S COMMAND
C2	DKBLU	1081	.35	CMC/47V STATUS BIT0
C3	BLK/WHT	1085	.35	CMC SPEED OUT
C4	ORN	1063	.35	APM 12V STATUS BIT 1
C5	YEL	1082	.35	CMC/47V STATUS BIT 1
C6				
C7	PPL	1083	.35	CMC/47V STATUS BIT 2
C8	GRA/BLK	754	.35	BLOWER MOTOR COMMAND OUT
C9	PNK/BLK	1217	.35	CMC DC CURRENT IN
CIO	PPL	1645	.35	BRAKE LOAD SHED IN
Cl 1	RED	2014B	.35	COOLANT PUMP COMMAND OUT
C12				
C13	DKGRN	335	.35	COOLING FAN COMMAND OUT
C14	ORN	840R	.35	REVERSING VALVE B+
C15	BLK	452C	.35	OUTSIDE AIR VALVE GROUND
C16	WHT	2016	.35	REVERSING VALVE HI OUT

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
DI				
D2	RED	1262	.35	APM 12V STATUS BIT0
D3	DKGRN	1614	.35	OUTSIDE AIR VALVE COMMAND OUT
D4	DKGRN	1264	.35	APM 12V STATUS BIT 2
D5	WHT	193C	.35	REAR DEFOGGER COMMAND OUT
D6	TAN	800H	.35	SERIAL DATA
D7				
D8				
D9	GRA/BLK	1596	.35	COOLANT RECOVERY CHECK VALVE COMMAND OUT
D10	BRN/WHT	1218	.35	MODE DOOR COMMAND OUT
Dll				
D12				
D13				
D14	BLK	452B	.35	MODE DOOR GROUND
D15	WHT	2027B	.35	WAKE-UP IN
D16	BLK / WHT	350H	.35	HTCM GROUND

CamScanner

HEAT PUMP VENTILATION SYSTEM/THERMAL CONTROL MODULE (HTCM)



PSMELC6725OAA

BLACK

12047946

Location: Passenger Compartment, Lower Right Side of I/P

CamScanner

f---------- HEAT PUMP VENTILATION SYSTEM II IERA4 AL CON I ROL MODULE- 12047946

/ CAVITY 1 WIRE COLOR		CIRCUIT NUMBER	WIRE 1 SIZE	I CIRCUIT FUNCTION
/ Al	WHT	900A	.50	EHPS GRD SENSE
1 A2	WHT	900A	.50	COMP GRD SENSE
A3	PPL	1838	.35	OUTSIDE AIR VALVE IN
A4	PPL	2028	.35	3-WAY COOLANT VALVE IN
A5	BLK	212	.35	CHARGER RECEP-TACLE COOLANT VALVE IN
A6	RED/BLK	380	.35	LOW SIDE REFRIG PRESSURE IN
A7	LTGRN/BLK	735	.35	OUTSIDE AIR TEMP IN
A8	LT CRN	2032	.35	DRIVE MOTOR COOLANT TEMP IN
A9	DKGRN	734	.35	DISCHARGE TEMP SENSOR IN
A10	YEL	1644	.35	HIGH SIDE REFRIG PRESSURE IN
All	RED	708	.35	MODE VALVE IN
A12	YEL	410	.35	COOLANT PUMP TEMP IN

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Bl	GRA	605A	.35	+5V REF SIGNAL
B2	ORN	840L	.35	HTCM BE
B3				
B4				
B5				
B6	BRN	4IN	.35	HTCM RUN 1
B7				
B8	LT CRN	1478C	.35	COOLANT LEVEL IN
B9	BLK/WHT	1704	.35	CHARGER RECEP-TACLE COOLANT VALVE GROUND
B10	TAN	134	.35	CHARGER RECEP-TACLE COOLANT VALVE COMMAND
BI1	BLK	452E	.35	COOLANT RECOV-ERY CHECK VALVE GROUND
B12	DKBLU	732	.35	REFRIG TEMP IN

CamScanner

HARNESS CONNECTOR FACES

HIGH NOTE HORN

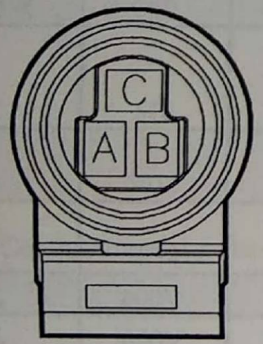
PSMELC67234AA

BLACK
12059595

HIGH NOTE HORN - 12059595				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	ORN	40	.35	B+
B	PPL	2O25B	.35	HORN COMMAND IN
C	BLK	350A	.35	GROUND

Location: Right Side, Above Wheel House Panel Liner

HIGH PRESSURE SENSOR



PSMELC6723IA A

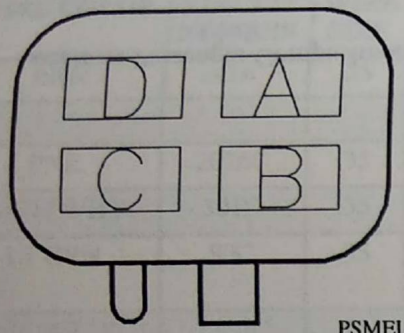
BLACK
12110192

HIGH PRESSURE SENSOR - 12110192				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK	552B	.35	GROUND
B	LT BLU *1* BLK	605F	**.35**	+5V REF
C	RED/BLK	380	.35	HIGH SIDE PRESSURE OUT

Location: Underhood, Left Side Attached to Refrigerant Line

CamScanner

INSIDE REARVIEW MIRROR



PSMELC67229AA

BLACK
12047785

INSIDE REARVIEW MIRROR - 12047785				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
A	WHT	I56C	.35	LAMPS LO
B	BLK	350M	.35	LAMPS GROUND
C	ORN	1732F	.35	LAMPS HI
D				

Location: Passenger Compartment, Behind Rearview Mirror

CamScanner

Location: Passenger Compartment, Center of I/P

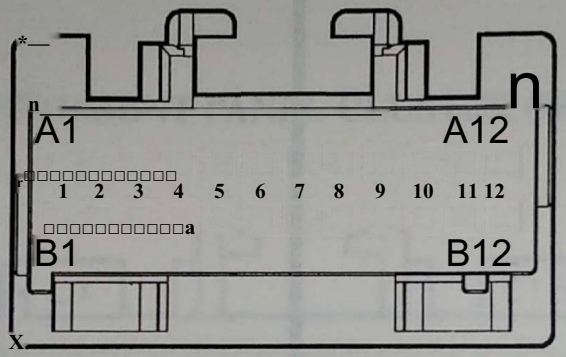
INSTRUMENT PANEL CLUSTER - 12110207

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
	BRN	41B	.35	RUN 1
C2				
C3	PNK	2026C	.35	LOW HORN OUT
C4	BRN / WHT	301C	.35	PARKLAMPS ON IN
C5	LT GRN	80C	.35	VEHICLE IN RUN/ACC IN
C6	YEL/BLK	1334C	.35	LR TURN IN
C7	LTBLU	1059	.35	PWR STRG HAND WHEEL SENSOR IN
C8	DKGRN/WHT	1335C	.35	RR TURN IN
C9	WHT	1765	.35	STEERING PUMP SPEED OUT
CIO	ORN/BLK	556	.35	PWR STRG HAND WHEEL SENSOR GROUND
Cll	PPL	2025C	.35	Hl HORN OUT
C12	BRN / WHT	230E	.35	DIM LEVEL IN
C13				
C14	BLK / WHT	450S	.35	GROUND
C15	GRA	1056	.35	PWR STRG HAND WHEEL SENSOR +5V REF
C16	DKBLU	1495F	.35	DOOR AJAR IN

CamScanner

HARNESS CONNECTOR FACES

LEFT HAND JUNCTION BLOCK (LHJB) (JI)



PSMELC67180AA

PINK
12110244

Location: Passenger Compartment Left, Under Left Side of I/P

CamScanner

LEFT HANDJUNCTIOb 4 BLOCK-.11 - 12110244

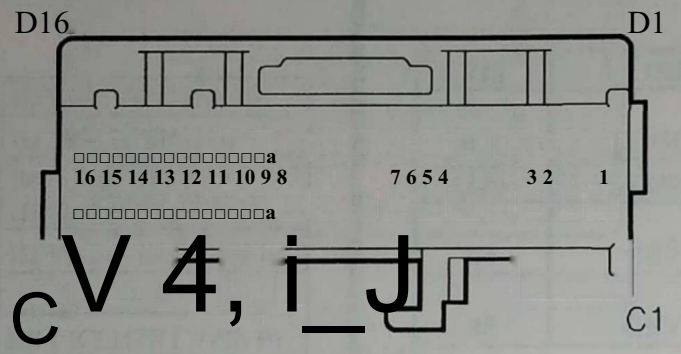
CAVITY I	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Al	DK BLU	1495F	.35	IPC DOOR AJAR
A2	WHT	202 7G	.35	CHARGE RECEPTACLE WAKE-UP
A3)	ORN	7J	.35	CLNT PUMP BUFFER RUN 1 WAKE-UP
A4	ORN	7F	.35	CLNT LEVEL SENSOR RUN l/WAKE-UP
A5	ORN	640H	.35	TURN SIGNAL SWITCH
A6	ORN	640B	.35	HEADLAMP SWITCH B+
A7	ORN	640C	.35	RR LICENSE LAMP HI
A8				
A9	PPL	524B	.35	HDLP SW HI BEAM IN
A10	YEL	525B	.35	HDLP SW LO BEAM IN
All	DK GRN/WHT	1335C	.35	IPC RRTURN OUT
A12	BRN/WHT	3010	.35	IPC PARKLAMPS ON

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Bl				
B2				
B3	BLK	407E	.35	RF BRAKE PRESSURE SENSOR GROUND
B4	BLK	407C	.35	LF BRAKE PRESSURE SENSOR GROUND
B5	BLK	407B	.35	MCIPRESSURE SENSOR GROUND
B6	GRA	4I6F	.35	MC2 PRESSURE SENSOR +5V
B7	GRA	416E	.35	RFPRESSURE SENSOR +5V
B8	GRA	416B	.35	MCI PRESSURE SENSOR +5V
B9	GRA	416H	.35	LF PRESSURE SENSOR +5V
BIO	BLK/WHT	238B	.35	IPC LH SEAT BELT
Bll	TAN	1885B	.35	SERVICE SOON IT PASS THRU
BI2	LT GRN	2030B	.35	IPC TEMP TT

CamScanner

HARNESS CONNECTOR FACES

LEFT HAND JUNCTION BLOCK (J2)



PSMELC67251A A

PINK

12110245

Location: Passenger Compartment, Under Left Side of I/P

CamScanner

LEI*THANI) JUNCTION BLOCK -J2- 12110245

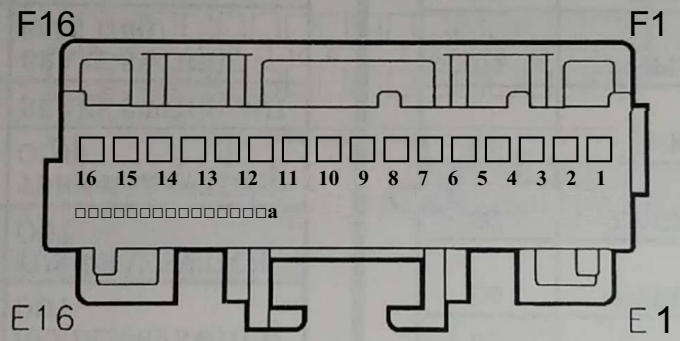
/ CAVITY	WIRE COLOR	CIRCUIT NUMBER 1	WIRE SIZE	CIRCUIT FUNCTION
1 C1	YEL/BLK	1334C	.35	IPC LR TURN OU F
C2	LTBLU	14	.50	LFTURNLAMPHI
C3	PNK	228C	1.0	WASHER PUMP Hl
C4	WHT	17	1.0	BRAKE SWITCH IN
C5	BRN/WHT	230E	.35	IPC DIM LEVEL
C6	ORN	2740	.35	CHARGER RECEPTACLE B+
C7	LTBLU	74	1.0	HEADLAMP SWI TCH OUT
C8	LT B LU/WHT |	1414	.35	TURN/HAZ SWITCH OUT
C9	DKBLU/WHT '	1415	.35	TURN/HAZ SWITCH OUT
CIO	BRN	86B	.80	BRAKE SWITCH OUT
Cll	BRN	86C	.35	BRAKE SWITCH PASS THRU
C12	BRN	41C	.35	PCM RUN 1
C13	BRN	41B	.35	IPC RUN 1
C14	BRN	41G	.35	TURN/HAZ SWITCH RUN 1
C15	BRN	41P	.35	CRUISE SWITCH RUN 1
C16	BRN	41R	.80	BRAKE SWITCH RUN 1

CAVITY	WIRECOLOR	CIRCUIT NUMBER	WIRE\(SIZE \	IRCUIT FUNCTION \ \\
DI	BRN/WHT	419B	.35	IPC SERVICE NOW INDICATOR
D2	RED	1084	.35	IPC CHECK TIRE PRESSURE INDICATOR
D3	WHT/BLK	2029	.35	IPC WAIT INDICATOR
D4	WHT	2019	.35	IPC BATE DAMAGE INDICATOR
D5				
D6	YEL	234C	.35	IPC SEAT BELT INDICATOR
D7	LT CRN	1478B	.35	COOLANT LEVEL SENSOR
D8	PNK	2014C	.35	COOLANT PUMP BUFFER
D9	PPL	2025C	.35	HIGH NOTE HORN COMMAND IN
DIO	PNK	2026C	.35	LOW NOTE HORN COMMAND IN
Dll				
D12	PPL	18O7E	.35	CHARGER RECEPTACLE CLASS 2 DATA
DI3	PNK	213C	.35	CHARGER RECEPTACLE TEMP
D14	RED	2O18B	.35	IPC REDUCED PERF INDICATOR
D15	TAN/WHT	816B	.35	PCM BTSI PASS THRU
D16	BLK	28	.35	HORN COMMAND

CamScanner

HARNESS CONNECTOR FACES

LEFT HAND JUNCTION BLOCK (J6)



PSMELC67249AA

TAN

12110112

Location: Passenger Compartment, Under Left Side of **I/P**

CamScanner

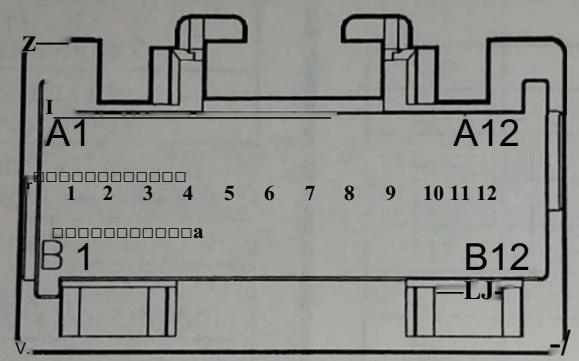
LEFT HANI) JUNCTION BLOCK-J6- 12110112

CAVITY	WIRE COLOR	1 CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
El	ORN	2540	.35	BTCM B+
E2	BLK	2015	.35	BTCM POWER MOD IN
E3	BLK	151	.35	PARK BRAKE SWITCH
E4	PNK	1632	.35	BTCM POWER MOD IN
E5	TAN/WHT	33	.35	BTCM BRAKE IND
E6	BLK	407A	.35	BTCM GROUND
E7	DKBLU	1660B	.35	BTCM LOW TRAC IND
E8	DK BLU/WHT	1934	.35	BTCM PARK BRAKE IND
E9	BRN	41E	.35	BTCM RUN 1
E10	WHT	852B	.35	BTCM ANTILOCK INDICATOR
Ell	ORN	640F	.35	PARK BRAKE SWITCH B+
E12	BRNAVHT	230F	.35	PARK BRAKE SWITCH
E13	BLK	450Y	.35	PARK BRAKE SWITCH GROUND
E14	BLK	450N	.35	DLC GROUND
E15	BLK	450T	.35	DLC GROUND
E16	BLK	1640	.35	DLC B+

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
Fl	PPL	1807C	.35	DLC CLASS 2 DATA 1
F2				
F3	TAN	800L	.35	DLC SERIAL DATA
F4	TAN	800E	.35	BTCM SERIAL DATA
F5	BLK	884B	.35	BTCM LR WSS HI
F6	BRN	882B	.35	BTCM RR WSS HI
F7	WHT	883B	.35	BTCM RR WSS LO
F8	RED	885B	.35	BTCM LR WSS LO
F9	GRA	416A	.35	BTCM +5V REF
F10				
Fll				
F12				
FI3				
FI4				
F15				
F16				

CamScanner

LEFT HAND JUNCTION BLOCK (J9)



PSMELC67180AA

PINK

12110244

Location: Passenger Compartment, Under Left Side of I/P

CamScanner

LEFT HAND JUNCTION BLOCK – J9 – 12110244

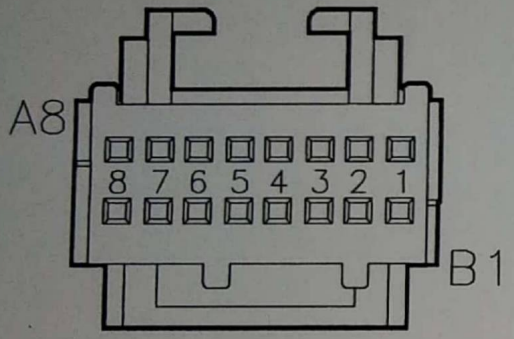
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A1	BRN	9A	.35	REAR LICENSE LAMPS HI REAR SIDE MARKER LAMPS HI REAR TAIL/STOP LAMPS HI
A2	YEL/BLK	1334A	.35	LR TURN LAMP HI
A3	LT GRN	1966A	.35	TO RH TURN/HAZ/DRL MODULE
A4	DK GRN/WHT	1335A	.35	TO RH TURN/HAZ/DRL MODULE
A5	LT BLU	20A	.80	STOP LAMPS HI
A6	BRN	41A	.35	FROM POWER MODING MODULE RUN 1
A7	YEL	820A	.35	CENTER HIGH MOUNTED STOP LAMP HI
A8	BRN/WHT	301B	.35	HEADLAMP SW TO RADIO
A9	BRN/WHT	301E	.35	HEADLAMP SW TO RSA
A10	RED	228A	.35	WASHER PUMP HI
A11	ORN	240	.35	RSA B+
A12	BRN/WHT	309A	.35	RF PARK LAMPS HI

CamScanner

HARNESS CONNECTOR FACES

LEFT HAND JUNCTION BLOCK (LHJB)

(J12)



PSMELC67I79AA

RED
12092632

LEFT HAND JUNCTION BLOCK - J12 - 12092632				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A1	BLK	450S	.35	DSCM GROUND
A2	BLK	450C	.50	LF PARK/TURN LAMP GROUND
A3	BLK	450G	.35	LF MARKER LAMP GROUND
A4	BLK	450P	.35	PSCM GROUND
A5	BLK	450R	.35	PCM GROUND
A6	BLK	106	.35	OIL PUMP LO
A7	BLK	450E	1.0	COOLANT PUMP BUFFER GROUND
A8	BLK	450EE	.35	CHARGE PORT GROUND
B1				
B2	BLK	450H	.35	CHARGE PORT GROUND
B3	BLK	450J	.35	COOLANT LEVEL SENSOR GROUND
B4				
B5				
B6				
B7				
B8				

Location: Passenger Compartment, Under Left Side of I/P

CamScanner

LOW NOTE HORN

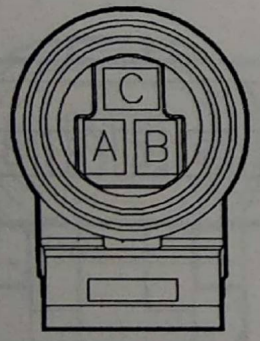
PSMELC67234AA

BLACK
12059595

LOW NOTE HORN - 12059595				
CAVITY	WIRECOLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	ORN	140	.35	B+
B	PNK	2026B	.35	HORN COMMAND IN
C	BLK / WHY	350B	.35	GROUND

Location: Right Side, Above Wheel House Panel Liner

LOW PRESSURE SENSOR



PSMELC6723IA A

BLACK
12110192

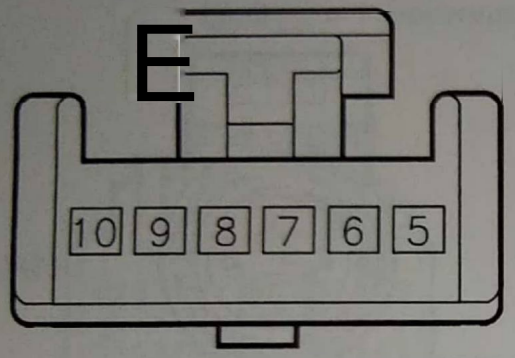
LOW PRESSURE SENSOR - 12110192				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK	552C	.35	GROUND
B	GRA	605G	.35	+5V REF
C	YEL	1644	.35	LOW SIDE PRESSURE OUT

Location: Underhood, Center Attached to Refrigerant Line

CamScanner

HARNESS CONNECTOR FACES

MODE VALVE ACTUATOR



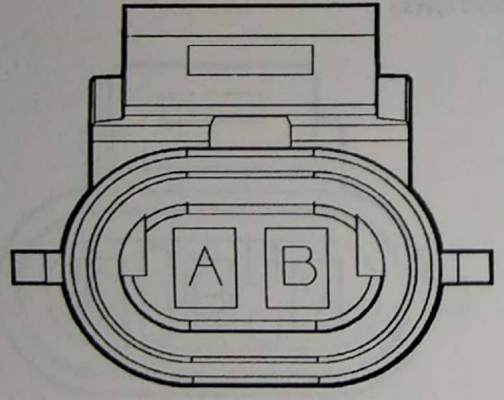
PSMELC68246AA

BLACK
12064993

MODE VALVE ACTUATOR - 12064993				
CAVITY	WIRECOLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
5	ORN	7C	.35	RUN 1 /WAKE-UP
6	BRN/WHT	1218	.35	VALVE COMMAND TN
7	BLK	452B	.35	GROUND
8				
9	RED	708	.35	VALVE POSITION OUT
10	LT BLU/BLK	605 B	.35	+5V REF IN

Location: Passenger Compartment, Under Right Side of I/P

MOTOR WINDING TEMPERATURE SENSOR



GRAY
12052644

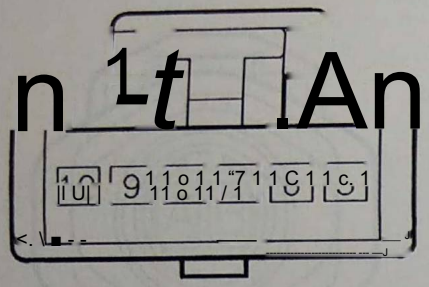
PSMELC66031AA

MOTOR WINDING TEMPERATURE SENSOR - 12052644				
CAVITY	WIRE COLOR	CIRCUIT NO.	WIRE-SIZE	CIRCUIT FUNCTION
A	LTGRN	37	.50	SENSOR HI
B	GRA/BLK	1798	.50	GROUND

Location: Underhood, Top Center of Drive Motor

CamScanner

OUTSIDE AIR VALVE ACTUATOR



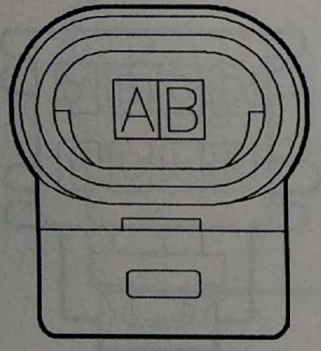
PSMELC68246AA

BLACK
12064993

OUTSIDE AIR VALVE ACTUATOR - 12064993				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
5	ORN	7E	.35	RUN 1/WAKE- UP
6	DKGRN	1614	.35	DOOR COMMAND IN
7	BLK	452C	.35	GROUND
8				
9	PPL	1838	.35	DOOR POSITION OUT
10	GRA	605C	.35	+5V REF IN

Location: Passenger Compartment, Under Right Side of I/P

OUTSIDE TEMPERATURE SENSOR



PSMELC68247AA

BLACK
12110170

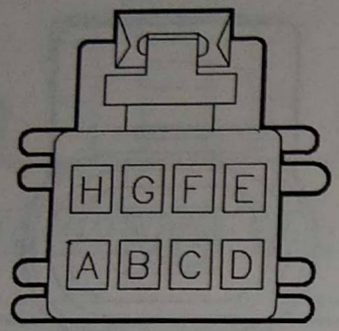
OUTSIDE TEMPERATURE SENSOR - 12110170				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	LT GRN / BLK	735	.35	SENSOR HI
B	BLK	552F	.35	GROUND

Location: Underbody, Behind Front Fascia

CamScanner

HARNESS CONNECTOR FACES

PARK BRAKE SWITCH



BLUE
12064766

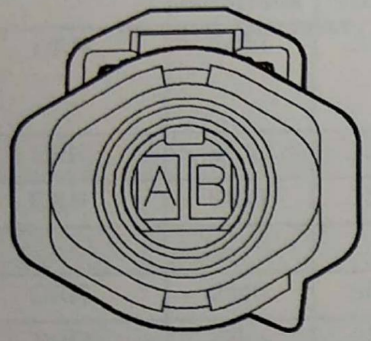
PSMELC67230AA

PARK BRAKE SWITCH - 12064766				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK	**450Y**	.35	GROUND
B			.35	
C	LTBLU	1134	.35	PARK BRAKE SWITCH IDLE OUT
D	ORN	640F	.35	B+
E	BLK/WHT	151	.35	GROUND
F	PNK	2031	.35	PARK BRAKE SWITCH WAKE-UP OUT
G				
H	BRN/WHT	23OF	.35	DIMMER IN

Location: I/P Lower Left

CamScanner

REFRIGERANT TEMPERATURE SENSOR



BLACK
12092512

PSMELC67245AA

REFRIGERANT TEMPERATURE SENSOR 12002512				
CAVITY	WIRECOLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
A	DK BLU	732	.35	SENSOR HI
B	GRA	552G	.35	GROUND

Location: Underhood, Left Side Attached to Refrigerant Line

REVERSING VALVE

PSMELC67246AA

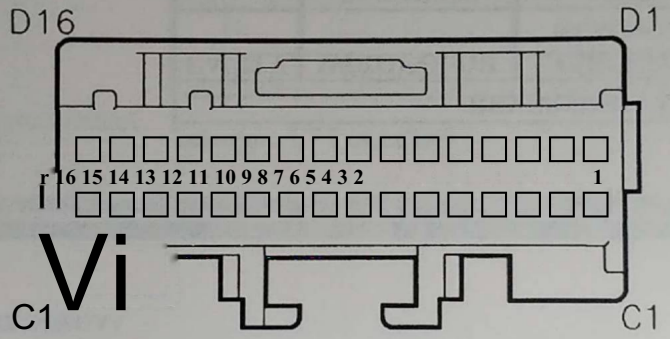
GRAY
12162343

REVERSING VALVE - 12162343				
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
A	BLK / WHT	35OR	.35	GROUND
B	WHT	2016	.35	VALVE Hl

Location: Underhood, Center of Crossmember

CamScanner

RIGHT HAND JUNCTION BLOCK (JI)



PSMELC6725IAA

PINK

12110245

Location: Passenger Compartment, Under Right Side of I/P

CamScanner

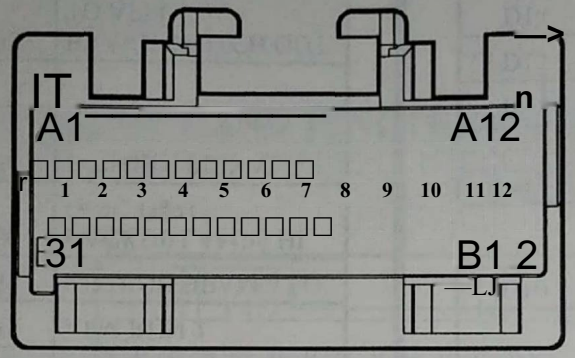
RIGHT HAND JUNCTION BLOCK-JI - 12110245

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Cl	ORN	840R	.35	TO HTCM - REVERSING VALVE B+
C2	ORN	840L	.35	HTCM B+
C3	ORN	840B	.35	BPM B+
C4				
C5	ORN	2840	.80	PRND ENCODER B+
C6	RED	228B	.35	WASHER PUMP Hl PASS THRU
C7	BRN	41S	.35	BPM RUN 1
C8	BRN	41N	.35	HTCM RUN 1
C9				
CIO	YEL	1139	.50	SDM RUN 1
CH	BRN	241B	.35	APM RUN 2
C12	LT CRN	1193B	.50	RH HIGH BEAM - LO
C13	LT GRN	24A	.50	BACKUP LAMPS HI PASS THRU
C14	DK BLU	15	.50	RF TURN SIGNAL - HI
C15				
C16	YEL	820C	.35	BRAKE SWITCH OUT TO APM

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
DI				
D2	PNK	2I3B	.35	CHARGE PORT TEMP TO BPM
D3				
D4	LT GRN	275E	.35	PRND ENCODER IN
D5	LT GRN	275B	.35	PRND ENCODER TO BPM
D6	PPL	1807B	.35	BPM CLASS 2 DATA
D7	WHT	108B	.35	BATTERY PACK FAN PASS THRU
D8	BLK/WHT	238E	.35	LH SEAT BELT SWITCH TO SDM PASS THRU
D9	PNK	2014B	.35	COOLANT PUMP TO HTCM PASS THRU
D10	LT GRN	1478C	.35	COOLANT LEVEL SENSOR TO HTCM PASS THRU
Dll	WHT	193C	.35	HTCM TO TJB PASS THRU
D12				
D13				
DI4				
D15	BRN	358E	.35	AIR BAG INDICATOR TO SDM
D14				

CamScanner

RIGHT HAND JUNCTION BLOCK (RHJB) (J2)



PSMELC67I80AA

PINK
12110244

Location: Passenger Compartment Under Right Side of I/P

CamScanner

1 RIGHT HAND JUNCTIO N BLOCK-J2- 12110244

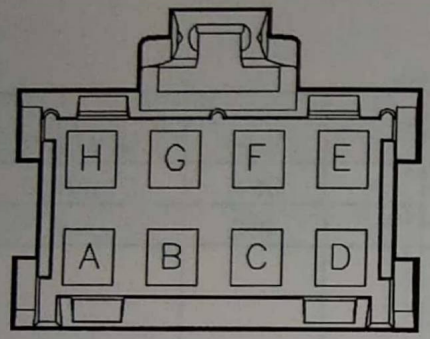
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Al	DKBLU	119IB	.50	RH LOW BEAM - LO
A2	ORN	40	.35	LOW NOTE HORN B+
A3	ORN	140	.35	HIGH NOTE HORN B+
A4	ORN	7K	.35	BPM RUN 1/ WAKE-UP
A5	ORN	7B	.35	COOLANT RECOV-ERY CHECK VALVE RUN 1/WAKE-UP
A6	ORN	7C	.35	MODE VALVE RUN 1/WAKE-UP
A7	ORN	7E	.35	OUTSIDE AIR VALVE RUN 1/WAKE-UP
AS	ORN	7H	.35	COOLING FAN BUFFER RUN 1/WAKE-UP
A9	ORN	7G	.35	CHARGER RECEPTACLE COOLANT VALVE RUN 1/WAKE-UP
A10	WHT	26B	.35	BPM WAKE-UP
All	BRN/WHT	309C	.35	RF PARK LAMP-HI
A12	BRN/WHT	309B	.50	RF MARKER LAMP-HI

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE ' SIZE	CIRCUIT FUNCTION
Bl				
B2	WHT	2027B	.35	HTCM WAKE-UP IN
B3	WHT	2027F	.35	BPM WAKE-UP IN
B4	WHT	2027C	.35	APM WAKE-UP IN
B5				
B6	PPL	2025B	.35	LOW NOTE HORN PASS THRU
B7	PNK	2026B	.35	HIGH NOTE HORN PASS THRU
B8				
B9				
B10	TAN	BOOH	.35	HTCM SERIAL DATA
Bll	TAN	800G	.35	BPM SERIAL DATA
B12	TAN	BOOK	.35	SDM SERIAL DATA

CamScanner

HARNESS CONNECTOR FACES

RIGHT HAND JUNCTION BLOCK (RHJB) (J5)



PSMELC67248AA

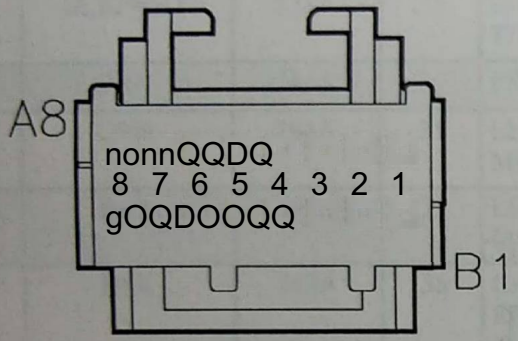
GRAY
12110626

RIGHT HAND JUNCTION BLOCK - J5 - 12110626				
CAVITY	WIRE COLOR	CIRCUIT NO.	WIRE-SIZE	CIRCUIT FUNCTION
A	BLK	35OF	1.0	FRONT END COOLING FAN BUFFER GROUND
B	RED	842	1.0	HAZ/RUN/ACC/MISC FUSEB +
C	RED	1442B	1.0	R HDLP LO FUSE B+
D				
E	BLK	350N	1.0	BLOWER MOTOR GROUND
F				
G	BLK	227C	1.0	WIPER MOTOR LO
H	DKBLU	227E	.35	WASHER PUMP LO

Location: Passenger Compartment, Under Right Side of I/P

CamScanner

RIGHT HAND JUNCTION BLOCK (RHJB) (J6)



PSMELC67179AA

RED
12092632

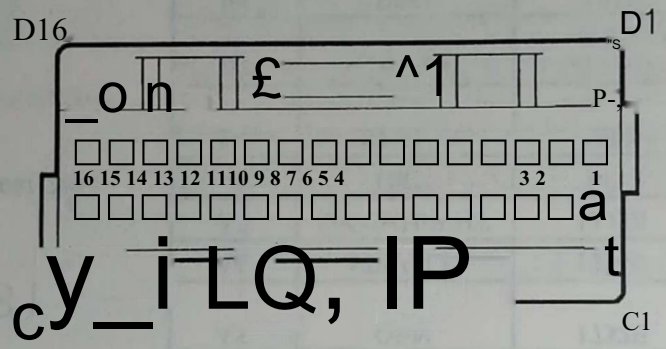
RIGHT HAND JUNCTION BLOCK -.16- 12092632				
CAVITY	VVIRE COLOR	CIRCUIT NO.	WIRE-SIZE	CIRCUIT FUNCTION
Al	BRN	9B	.35	REAR LICENSE LAMPS HI REAR SIDE MARKER LAMPS HI REARTAIL/STOP LAMPS HI
A2	BRN	41F	.35	DEFOGGER MODULE RUN I
A3	ORN	1732G	.35	FOUR BAR LAMP HI
A4	ORN	I732F	.35	INSIDE REAR VIEW MIRROR
A5	ORN	1732E	.35	CARGO LAMP SWITCH HI
A6	YEL/BLK	I334B	.50	LR TURN LAMP HI
A7	DK GRN/WHT	1335B	.35	RR TURN LAMP HI
A8	ORN	1440	.35	POWER OUTLET B+
Bl	LT BLU	20B	1.0	STOP LAMPS B+ PASS THRU
B2	BLK	350M	.35	INSIDE REAR VIEW MIRROR GROUND
B3	WHT	I93B	.35	REAR DEFOGGER COMMAND - DEFOG-GER MODULE
B4	YEL	820B	.50	CENTER HIGH MOUNTED STOP LAMP -HI
B5	WHT	108C	.35	BAIT PACK FAN PASS THRU
B6	LT BLU	156B	.35	FOUR BAR LAMP LO
B7	WHT	156	.35	INSIDE REAR VIEW MIRROR LO
B8	LTGRN	24B	1.0	BACKUP LAMPS HI PASS THRU

Location: Passenger COmpartment, Under Right Side of I/P

CamScanner

HARNESS CONNECTOR FACES

RIGHT HAND JUNCTION BLOCK (J9)



PSMELC67251A A

PINK

12110245

Location: Passenger Compartment, Under Right Side of I/P

CamScanner

RIGHT HAND JUNCTION BLOCK -J9- 12110245

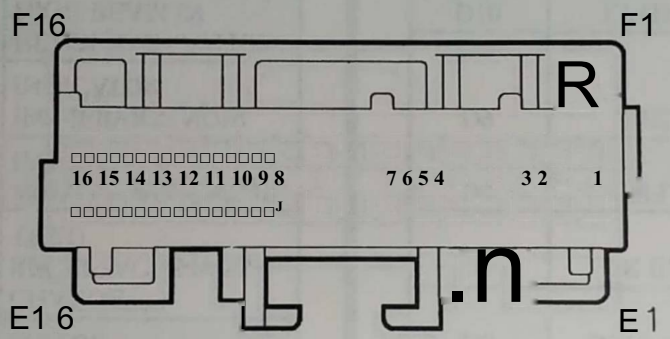
/ CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Cl	DK BLU/WHT	1495A	.35	DOOR JAMB SWITCH HI
C2	TAN	167	.35	RSA RH WINDOW DOWN
C3	BLK/WHT	238A	.35	LH SEAT BELT PASS THRU
C4	BRN	241A	.35	PSCM RUN 2
C5	ORN	294A	.35	LH DOOR LOCK MOTOR
C6	GRA	295A	.35	LH DOOR LOCK MOTOR
C7	PNK	213A	.35	CHARGE RECEPTACLE PASS THRU
C8	BRN	358A	.35	AIR BAG INDICATOR IPC
C9	BRN/WHT	419A	.35	IPC SERVICE NOW INDICATOR
CIO	PPL	524A	.35	HEADLAMP SWITCH HIGH BEAM IN
Cll	YEL	525A	.35	HEADLAMP SWITCH LOW BEAM IN
C12	LTBLU	166	.35	RSA RH WINDOW DOWN
C13	RED/BLK	78OA	.35	LH DOOR LOCK SWITCH - LOCK
C14	BLK	1051	.35	RADIO GROUND
C15	WHT	852A	.35	BTCM ABS INDICATOR
C16	WHT	2027A	.35	CHARGER RECEPTACLE

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION \
DI	WHT	2027E	.35	BATTERY RECOVERY SWITCH WAKE-UP
D2	RED	2014A	.35	COOLANT PUMP BUFFER PASS THRU
D3	YEL	234A	.35	IPC SEAT BELT INDICATOR
D4	TAN	800J	.35	IPC SERIAL DATA
D5	PPL/WHT	889A	.35	RH HORIZONTAL MIRROR MOTOR
D6	BRN/WHT	1498A	.35	RH MIRROR MOTOR HI
D7	DKBLU	1660A	.35	BTCM LOW TRAC INDICATOR
D8	PPL	1885A	.35	PCM SERVICE SOON INDICATOR
D9	RED	2O18A	.35	IPC REDUCED PERFORMANCE INDICATOR
DIO	LTGRN	2O3O/\	.35	IPC TEMP IND
Dll	PNK	2026A	.35	HIGH NOTE HORN PASS THRU
D12	PPL	2025A	.35	LOW NOTE HORN PASS THRU
D13	RED/WHT	881A	.35	RH VERT MIRROR MOTOR
D14	LTGRN	838A	.35	TURN/HAZ/DRL MOD
D15	PPL	1807A	.35	BPM CLASS 2
D16	ORN/BLK	781A	.35	RF LH DOOR LOCK SWITCH - UNLOCK

CamScanner

HARNESS CONNECTOR FACES

RIGHT HAND JUNCTION BLOCK (J12)



PSMELC67249AA

TAN

12110112

Location: Passenger Compartment, Under Right Side of I/P

CamScanner

1-------- RIGHT HANI) JUNCTION

CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
El	BLK/WHT	350H	.35	HTCM GROUND
E2	BLK	350S	.35	BPM GROUND
E3	BLK/WHT	35OB	.35	HIGH NOTE HORN GROUND
E4	BLK	35OA	.35	LOW NOTE HORN GROUND
E5	BLK/WHT	3506	.35	RE MARKER LAMP GROUND
E6	BLK/WHT	1751	.35	SDM GROUND
E7	BLK/WHT	35OC	.50	RE PARK/TURN LAMP GROUND
E8	BLK	35OE	.35	BPM GROUND
E9				
E10				
Ell	BLK	552B	.35	LOW PRESSURE SENSOR GROUND
E12	BLK	552C	.35	HIGH PRESSURE SENSOR GROUND
E13	BLK/WHT	35OR	.35	REVERSING VALVE GROUND
E14	BLK	35OK	.35	BPM GROUND
E15	BLK/WHT	552E	.35	DISCHARGE TEMP SENSOR
E16	BLK	552F	.35	OUTSIDE TEMP SENSOR GROUND

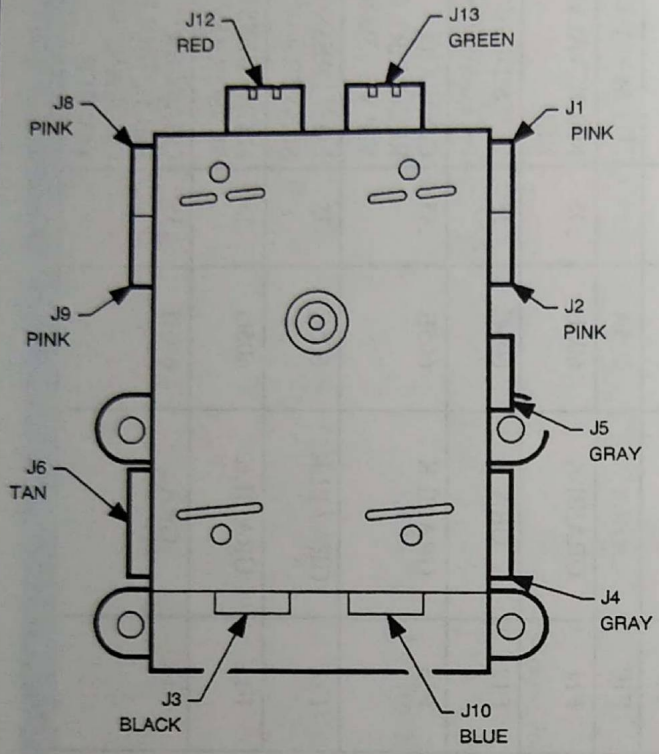
4 BLOCK-.112- - 12110112

1

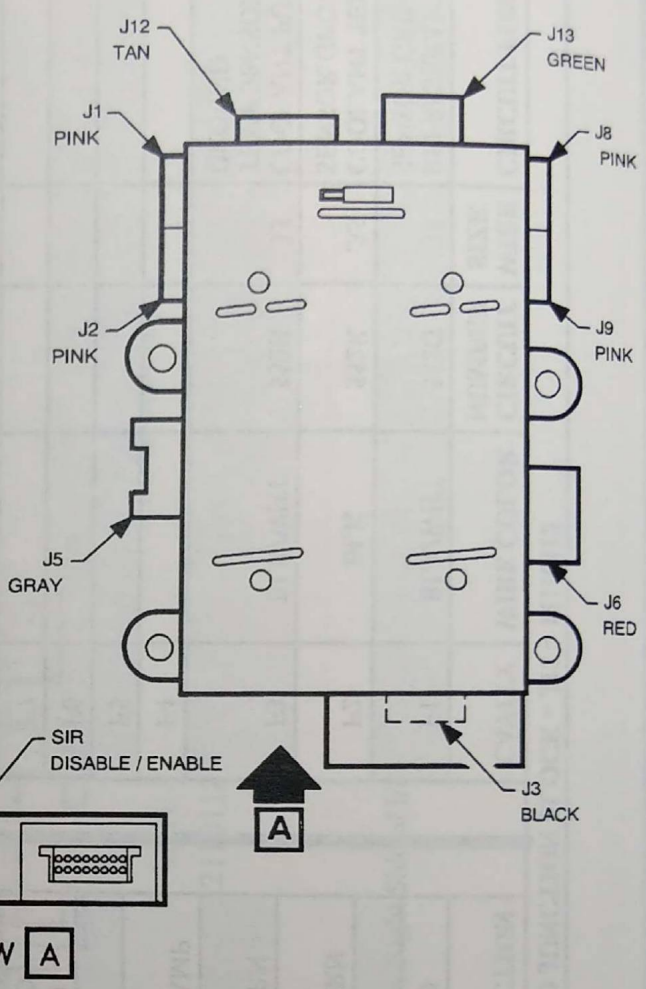
CAVITY	WIRE COLOR	CIRCUIT NUMBER	WIRE SIZE	CIRCUIT FUNCTION
Fl	BLK/WHT	552G	.35	REFRIGERANT TEMP SENSOR GROUND
F2	BLK	552K	.35	COOLANT FEMP SENSOR GROUND
F3	BLK/WHT	552H	.35	COOLANT PUMP TEMP SENSOR GROUND
F4				
F5				
F6				
F7				
F8				
E9				
F10	GRA	605A	.35	HTCM +5V REF
Ell	GRA/BLK	605 B	.35	MODE VALVE +5V REF
F12	GRA	605C	.35	OUTSIDE AIR VALVE ACTUATOR +5V REF
F13	GRA/BLK	605E	.35	COOLANT RECOVERY CHECK VALVE +5V REF
F14	GRA/BLK	605F	.35	LOW PRESSURE SENSOR +5V REF
Fl 5	GRA/BLK	605G	.35	HIGH PRESSURE SENSOR +5V REF
FI6	GRA	605H	.35	CHARGER RECEPTACLE COOLANT VALVE +5V REF

CamScanner

LH JUNCTION BLOCK

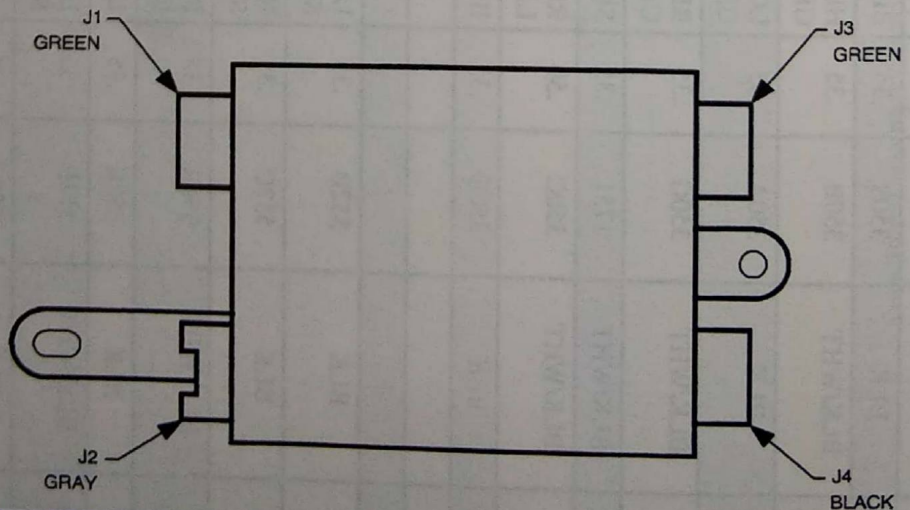


RH JUNCTION BLOCK



VIEW A

TRUNK JUNCTION BLOCK

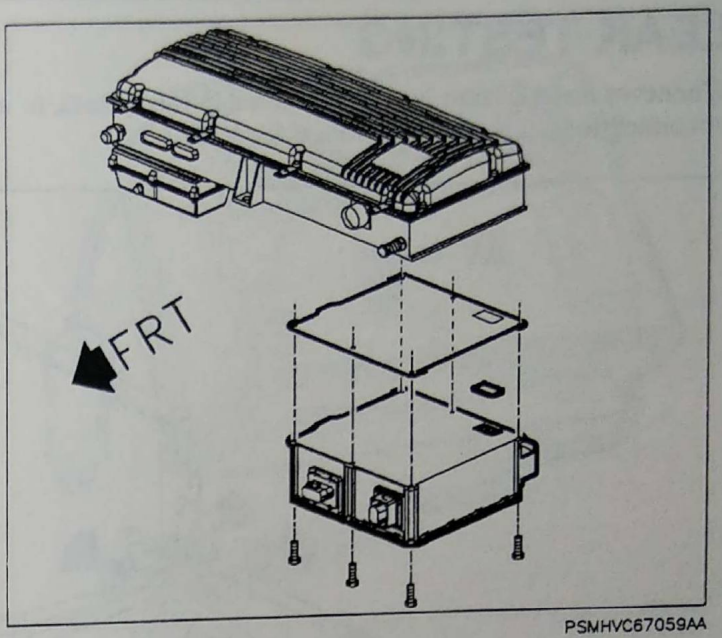


PSMELC68272AA

CamScanner

ACCESSORY A/C AND D/C POWER MODULE (APM)

• CAITHOS: TO REDUCE THE RISK OF SFVFDV SHOCKS AND BURNS, THE HIGH VOLTAG^ SYSTEM SHOl LD BE DISABLED ANY TTMr SERMCE WORK IS BEING PERFORMED ON no AROUND THE HIGH VOLTAGE SYSTEM POUBT. ALWAYS DISABLE THE HIGHVO Ir. SYSTEM. THE 12 VOLT SYSTEM WILI ACTIVE AFTER THE HIGH VOLTAG F «vel BEEN DISABLED.



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REMOVAL

1, Remove the PEB. (Refer to the PEB removal procedure in this service manual.)

P 2. With the PEB removed, turn the PEB over onto a soft surface to prevent scratching or damage to the PEB cover.

3. Remove the six APM to PIM screws.

4. Carefully lift the APM straight up from the PIM until the connector is disconnected. Remove the APM.

5. Remove the APM gasket and clean the gasket surface with alcohol. The gasket must be replaced.

6. Remove the O-ring seal from the APM to PIM ft connector cavity.

INSTALLATION

1- Make sure the APM and PIM gasket surfaces are clean and dry. Properly align new gasket on the PIM mating surface.

2. Install new connector O-ring.

3. Position the APM above the PIM connector and carefully lower APM onto PIM connector.

4. Install the six APM to PIM screws and evenly tighten ■h the screws and torque.

Torque: 37 N»m (50 ft-lbs)

5- Install the PEB. (Refer to the PEB installation Procedure in this manual.)

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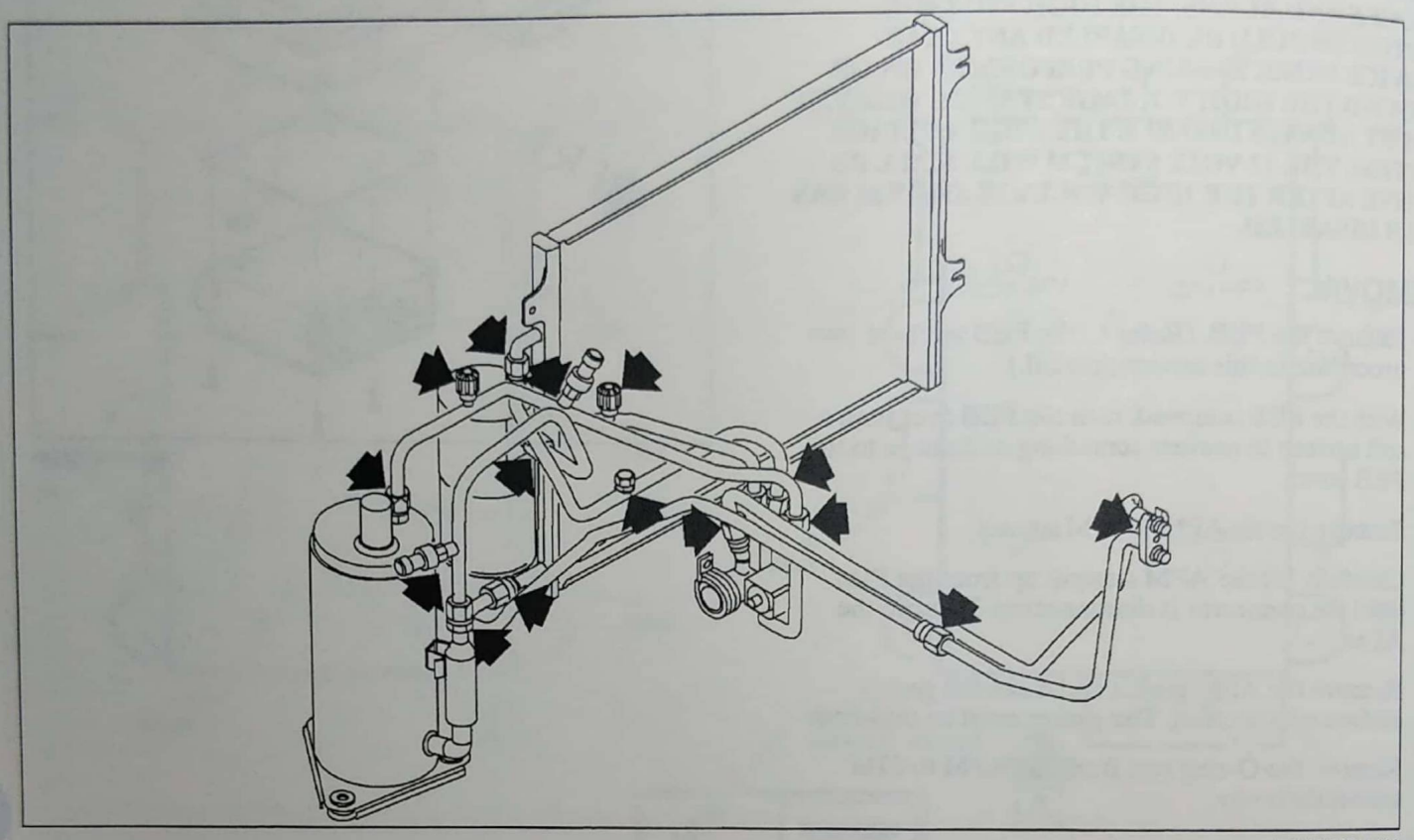
LEAK TESTING

Whenever a refrigerant leak is suspected in the system, or a service operation performed which results in disturbing lines or connections, it is advisable to test for leaks.



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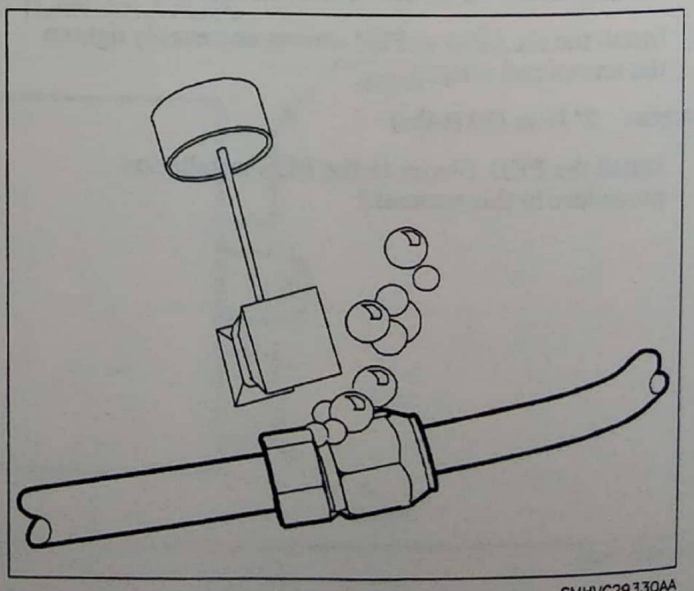
CAUTION: R-134A SERVICE EQUIPMENT OR VEHICLE HEAT PUMP SYSTEMS SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR/R-134A HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE. ADDITIONAL HEALTH AND SAFETY INFORMATION MAY BE OBTAINED FROM REFRIGERANT AND LUBRICANT MANUFACTURERS.

LIQUID LEAK DETECTORS

There are a number of locations (such as fittings, valves, etc.) on the heat pump system where a liquid leak detector solution may be used to pinpoint refrigerant leaks. Apply soap solution to the area in question. Bubbles will form indicating a leak.

IMPORTANT: Gauge port caps are the primary seals for the gauge port valves. They must be installed and tightened with O-ring seals in place to avoid a refrigerant leak.

IMPORTANT: Rinse soap solution from fitting before making repair.



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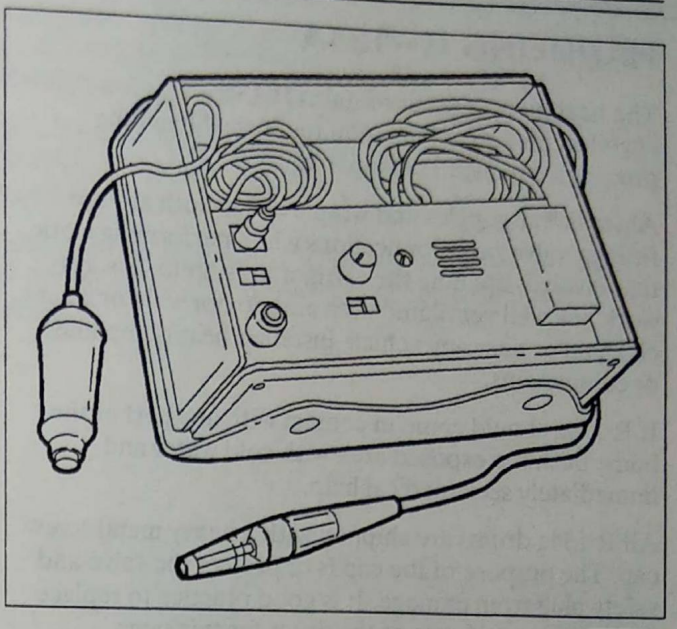
ELECTRONIC LEAK TESTERS

Ctricted access areas (such as sections of evaporator F°r rC L e nser) an electronic leak detector is advisable, and conu

, TinN. CARE SHOULD BE TAKEN TO rtTNT'PERSONAL INJURY WHICH COULD ir R DEE TO TOUCHING A HOT COMPONENT SR HOOD WHEN TESTING, TESTS SHOULD BE KE WITH THE CAR IN "LOCK" MODE AND AS COOL AS POSSIBLE. TEST SHOULD NOT BE RUN WEN FRONT END FAN IS OPERATING. DO NOT OPERATE THE DETECTOR IN A COMBUSTIBLE ATMOSPHERE SINCE ITS SENSOR OPERATES AT A HIGH TEMPERATURE.



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The successful use of this and any other electronic leak detector depends greatly upon the scan rate and upon carefully following the manufacturer's instructions regarding calibration, operation, and maintenance. Each joint must be completely circled moving at 25-50 mm (1-2 in.) per second with the tip of the probe as close to the surface as possible but no more than 6.35 mm (1/4 in.) away and without blocking air intake. A leak is indicated when the audible tone goes from a steady 1-2 clicks per second to a solid alarm. The balance knob should be adjusted frequently to maintain the 1-2 clicks per second.

IMPORTANT: Gauge port caps are the primary seals for the gauge port valves. They must be installed and tightened with O-ring seals in place to avoid a refrigerant leak.

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HANDLING R-134A

The heat pump system contains R-134a. This is a chemical mixture which requires special handling procedures to avoid personal injury.

Always wear goggles and wrap a clean cloth around fittings, valves and connections when performing work that involves opening the refrigerant system. Always work in a well ventilated area and do not weld or steam clean on or near any vehicle installed heat pump lines or components.

If R-134a should come in contact with any part of the body, flush the exposed area with cold water and immediately seek medical help.

All R-134a drums are shipped with a heavy metal screw cap. The purpose of the cap is to protect the valve and safety plug from damage. It is good practice to replace the cap after each use of the drum for this same reason.

If it is necessary to transport or carry any container of R-134a in a vehicle, do not carry it in the passenger compartment.

The refrigerant system may be evacuated and charged using an air conditioning service charging station or a manifold and gauge set and a drum of R-134a (13.6 kg [30 lbs.]).

Before removing and replacing any of the heat pump refrigeration lines or components, the R-134a must be completely recovered from the system using an approved refrigerant recovery system.

Always use service valve and charging station equipment or pressure gauge sets during evacuation and charging procedures.

CAUTION: DO NOT CONNECT ANY LINE TO THE LOW SIDE SERVICE FITTING DURING CHARGING PROCEDURE.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The efficient operation and life of the heat pump system is dependent upon the chemical stability of the refrigeration system. When foreign materials, such as dirt, air, or moisture contaminate the refrigeration system, they will change the stability of the R-134a and viscosity of refrigerant oil. They will also affect pressure-temperature corrosion and abnormal wear of moving parts.

ADDING OIL

Adding oil to the heat pump system should take place after recovery and evacuation. Follow oil charge replenishing instructions provided with the charging station in use with the following exceptions:

1. Use only EV compressor oil (Ester oil), P/N 27002486.
2. Use a clean oil bottle on charge station.

OIL DISTRIBUTION

EVi heat pump system requires 480 ml (16.3 oz.) of Polyol Ester compressor oil. Service compressors have 480 ml (16.3 oz.) of Ester oil installed.

New oil quantities must be added to system during component replacement and conditions stated as follows:

With no signs of excessive oil leakage, add:

a. Compressor - Remove, drain and measure oil. Drain replacement compressor. Add the same amount of new Ester compressor oil drained from removed compressor to replacement compressor. (Refer to “Compressor” section for details.)

b. Evaporator — Add 50 ml (1.7 oz.) of new Ester compressor oil.

c. Condenser — Add 50 ml (1.7 oz.) of new Ester compressor oil.

d. Accumulator — Remove drain and measure oil. Add the same amount of new Ester compressor oil drained from the removed accumulator to the replacement accumulator plus. Add 25 ml (.85 oz.) of new Ester compressor oil even if no oil is present in the replaced accumulator.

REFRIGERANT OIL LOSS DUE TO A LARGE LEAK

If the refrigerant charge is abruptly lost due to a large refrigerant leak, (line rupture or collision), approximately 50 ml (1.7 oz.) of refrigerant oil will be carried out of the system suspended in the refrigerant. Any failure that caused an abrupt refrigerant discharge will cause the oil loss. Conditions that allow the refrigerant to seep or bleed off over time do not cause this oil loss.

Upon replacement of a component which caused a large refrigerant leak, add 50 ml (1.7 oz.) of new Ester compressor oil plus the required amount of oil for the particular component (as outlined previously).

Add the oil directly to the replaced component if possible. If the oil cannot easily be added to the replaced part, add oil after evacuation and before recharge (as outlined previously).

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EVACUATING, AND *COVERING, tv«^,—n an URGING THE HEAT PUMP*

SYSTEM

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f THROUGH THE LOW PRASSI J/LMP
^SYSTEM. COMPONENT DS? SI»E
ANAL INJURY COULD RESUU E AND

ftp

NOTICE: Under no circumstances should alcohol be used in the system in an attempt to remove moisture. Damage to the system components could occur.

If the system has been opened for any repair, or the R-134a charge lost, the system must be evacuated prior to charging.

Evacuation and charging is a combined procedure and all gauge lines must be purged with R-134a prior to charging.

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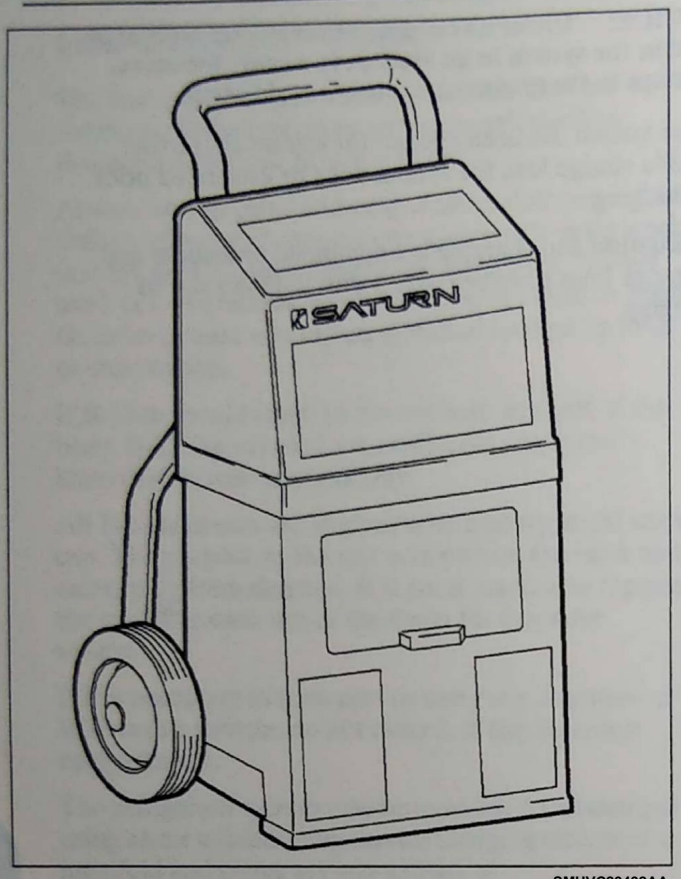

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HEAT PUMP SYSTEM R-134A RECOVERY

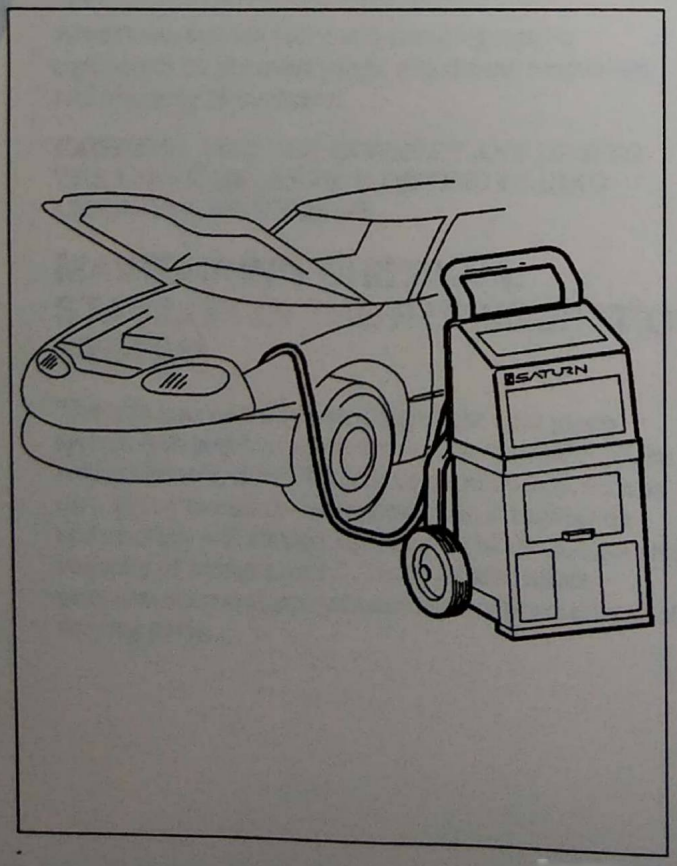
Before removing or replacing any of the heat pump refrigerant lines or components, the refrigerant must be completely recovered.

The refrigerant system must be discharged using an air conditioning refrigerant recovery and recycling system. Follow the manufacturer's operating instructions for system being used.

NOTICE: The air conditioning refrigerant and recycling station must meet UL standards for moisture and contamination removal. Recovery system which cannot meet these standards are not approved for warranty repairs. Reuse of moisture or particulate contaminated refrigerant will result in premature compressor and other component failure.

Always check heat pump system for pressure with a manifold gauge set to determine if refrigerant is present in the system. Performing recovery on a heat pump system which is open to atmosphere as a result of a leak, would allow the recovery station to pull only air into the tank.

NOTICE: Failure to check for residual oil from the previous recovery can result in adding extra oil to the vehicle currently being serviced. This will also result in insufficient oil in the system previously worked on and could possibly contribute to premature compressor failure.



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EVACUATING THE SYSTEM

1. Install new Electric Vehicle approved service replacement heat pump schrader valves prior to evacuating system. Even though a schrader valve may look the same, it is extremely important that only recommended service replacement heat pump schrader valves be used or leakage of refrigerant will occur.
2. The refrigerant system must be evacuated using an air conditioning refrigerant recovery and recycling system. Follow the manufacture's operating instructions for system being used.
3. Allow system to evacuate for the predetermined time on the refrigerant recovery and recycling system. Note vacuum gauge readings.
4. Watch low side gauge for vacuum loss (one to three minutes). If loss is less than 3.38 kPa (1 in. Hg) f^{tOin} level recorded in Step 3, proceed to charging the heat pump system.
5. If vacuum loss is greater than 3.38 kPa (1 in. Hg) from level recorded in Step 3, charge with 0.23 kg (1/2 lb.) R-134a. Leak test, repair leaks, and re-test-

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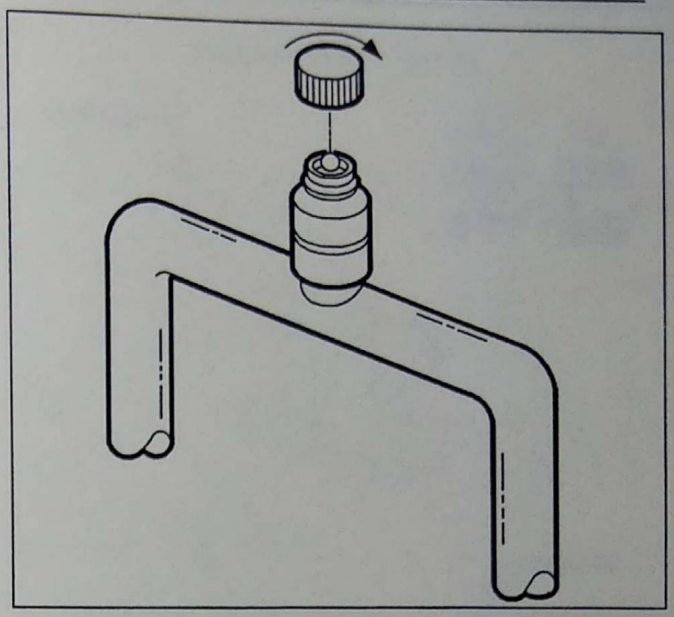
BARGING THE HEAT PUMP 5YSTEM

frieeraiH system must be charged using a R-134a ^.^ditioning refrigerant charging system. Follow the 8ir^ °hcturcr's operating instructions for system being 5with the following exceptions.

1. Po not connect low pressure line to the heat pump system.
2. Keep the low pressure valve on the charging station closed at all times.
3. Perform the entire charge procedure through the high-pressure service fitting on the discharge pipe.
4. Charge the heat pump system with 0.91 kg (2.0 lbs.) ofR-134a refrigerant.

IMPORTANT: Make sure there is an O-ring seal inside of caps before installation because the cap is the primary seal for heat pump system service fittings. Failure to lighten cap will result in refrigerant leakage.

5. Install protective caps on service fittings and hand tighten.
6. Leak check system with electronic leak detector or equivalent.
7. With system fully charged and leak-checked, conduct a functional and performance test. (Refer to Diagnostic flow chart.)



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HANDLING REFRIGERANT LINES AND FITTINGS

1. Clean tools and a clean work area are important f$_0$ proper heat pump system service. Joints, fittings, and components should be cleaned before any on-vchic| repairs. Clean with solvent, dry with air and use only lint free cloths to wipe parts.
2. All metal tubing lines should be free of dents or kinks to prevent loss of system capacity due to line restrictions.
3. When disconnecting any fitting in the refrigeration system, the system must first be discharged of all the R-134a. Using an approved refrigerant recovery system, proceed very cautiously regardless of gauge readings. Injury can occur if there happens to be liquid R-134a in the line. If pressure is noticed when fitting is loosened, re-tighten fitting and recover remaining refrigerant.
4. In the event any refrigerant line is opened to the atmosphere, it should be capped or taped to prevent entrance of moisture and dirt, which can cause internal compressor wear or plugged lines in condenser and evaporator core. Always replace O-rings on any lines that are removed.
5. The use of the proper wrenches when making connections on the O-ring fitting is important. The opposing fitting should always be backed up with a wrench to prevent distortion of connection lines or components.
6. Tighten all tubing connections as shown in chart. Insufficient or excessive torque when tightening can result in loose joints or deformed parts. Either condition can result in refrigerant leakage.
7. O-rings and seats must be in perfect condition. A burr or piece of dirt may cause a refrigerant leak. When replacing the O-ring, first coat it with clean R-12 refrigerant oil and position on line as shown.

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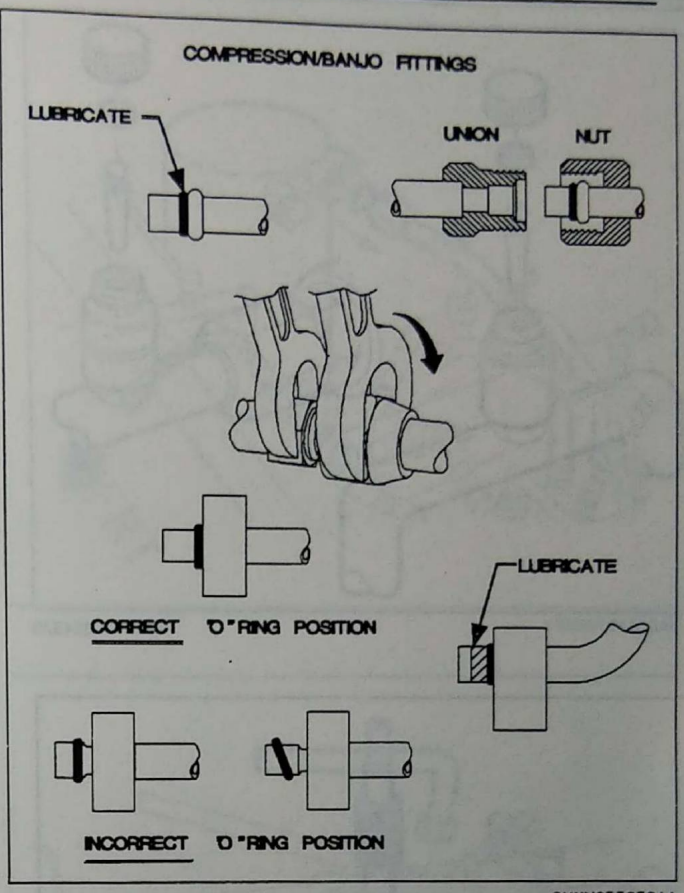
Q^RINGS

NOTE: Use onlv R12 Rcfr‘gcrant oil (mineral) to lubrica■te O-rings. Use of R-134a (PAG) oil or R-134a heat nump (Ester) oil will CaUSe Premature corrosion of fitting J010S .

1. Install new Electric Vehicle service replacement heat nump system O-rings whenever a joint or fitting is disassembled, except when provided on new components. Even though an O-ring may look the same, it is extremely important that only recommended service replacement heat pump system O-rings be used or leakage of refrigerant will occur.
2. When replacing O-rings on a heat pump component or joint reconnection, the fitting design should be carefully identified to ensure installation of the correct heat pump service replacement O-ring. Use a non-metal tool (e.g. plastic pick) to remove O-ring to avoid damaging the mating surface on the fitting.
3. O-ring should be coated with new R-12 mineral compressor oil prior to installation, but must not be soaked.
4. Prior to installation, verify that both the O-rings and fittings have not been nicked or deformed. Deformed or nicked parts must be replaced. Failure to use proper service replacement parts and procedures may result in excessive refrigerant leakage.



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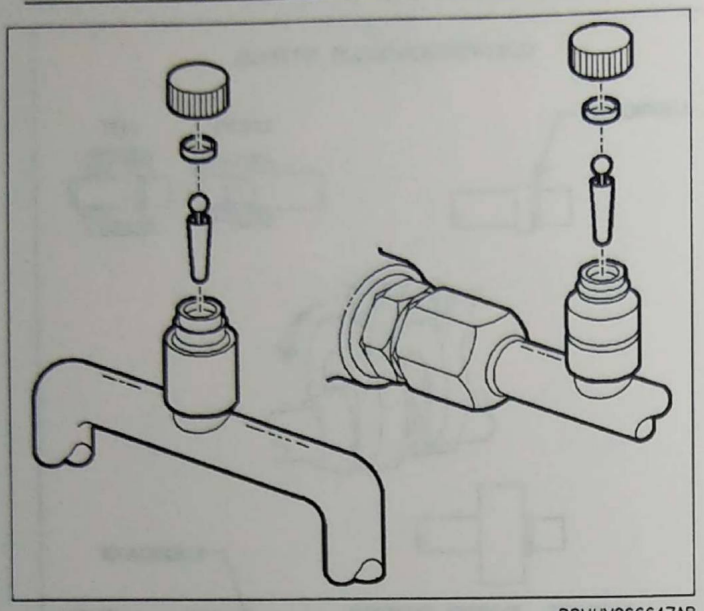

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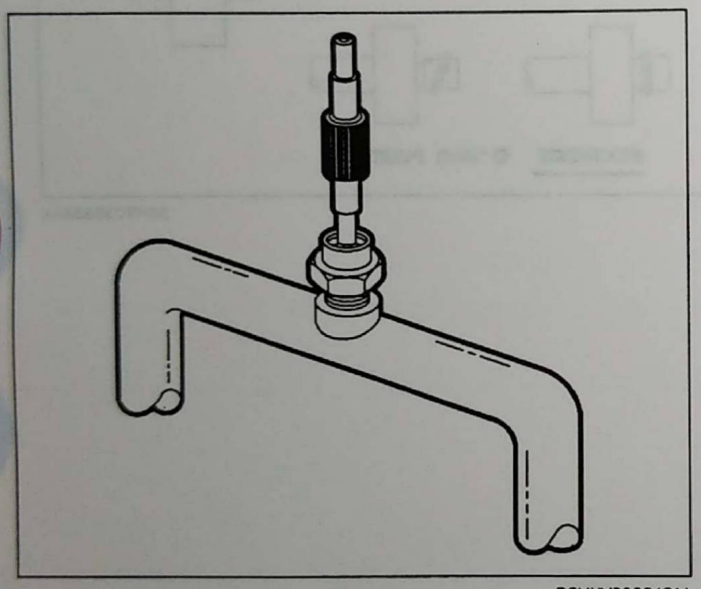
SERVICE GAUGE PORT VALVES

The heat pump refrigerant system has a high pressure (discharge) and a low pressure (suction) gauge port valve. These valves provide access to both sides (high and low pressure) of the system. Always replace the valves after recovery of refrigerant is complete and prior to evacuation procedure. Always install the protector cap on the gauge port valves after servicing the heat pump system to avoid refrigerant from escaping.

IMPORTANT: Gauge port caps are the primary seals for the gauge port valves. They must be installed and tightened with O-ring seals in place to avoid a refrigerant leak.



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VALVE CORE

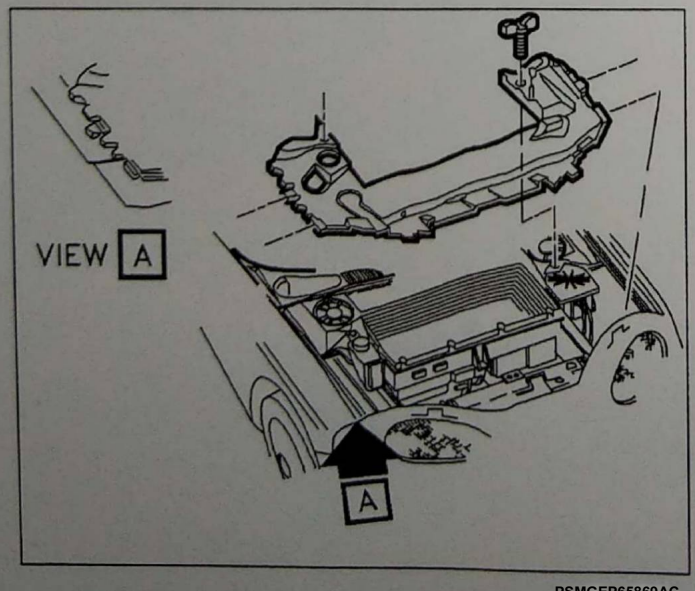
REMOVAL

1. Discharge refrigerant system using an approved refrigerant recovery system.
2. Remove valve core using tool number SA9149AC-7.

INSTALLATION

1. Install and tighten valve core with tool number SA9149AC-7.
2. Evacuate, charge, and leak test heat pump system.

NOTICE: To prevent loss of refrigerant charge, make sure to install and tighten cap. Replace cap if seal is missing or damaged.



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A/C ACCUMULATOR TUBE ASSEMBLY

REVERSING VALVE TO ACCUMULATOR

REMOVAL

1. Place keypad in “lock” mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.

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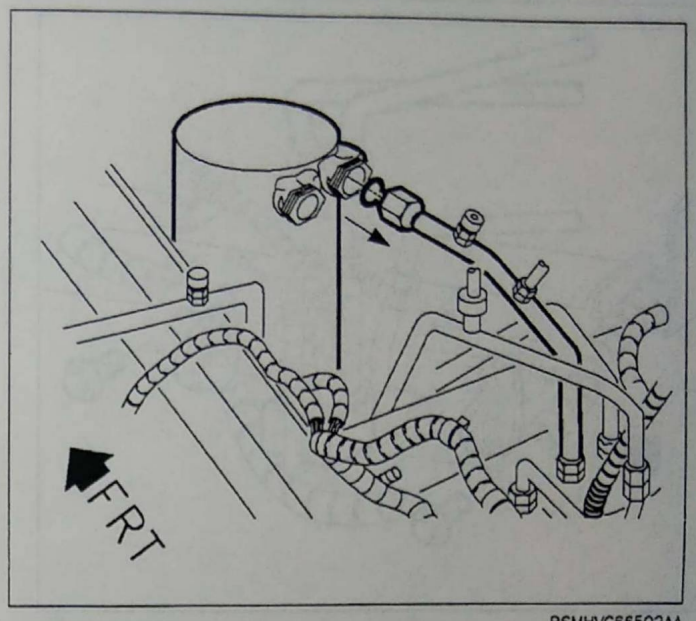
korap coupler is not installed in charger

4 Verify ch arge H receptacle.

5. R enl^ e power electronics bay. (Refer to "Power Elec njcs gay" removal procedure in this manual.)

NOTICE: Always use a wTench to back up the opposing fitting when disconnecting connections. Failure to use a h to back up fittings could cause distortion of ictions. tubes or components.

b Disconnect accumulator tube from accumulator.



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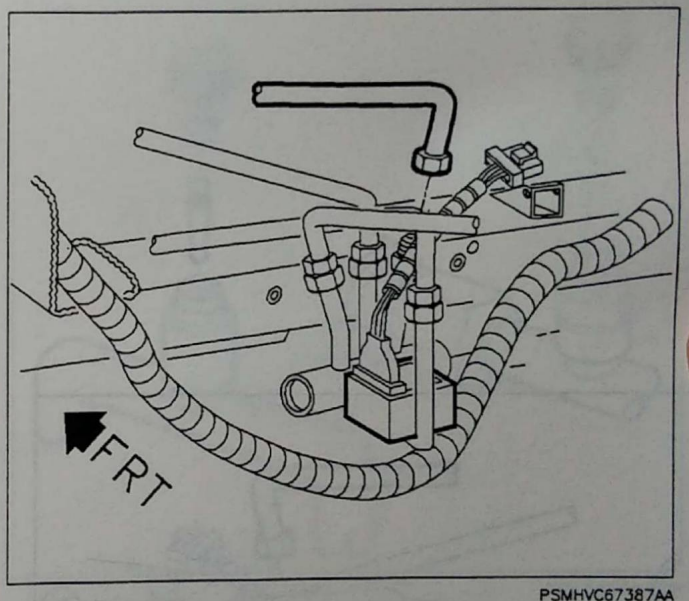
7. Remove reversing valve retainers from front lower tie bar.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wTench to back up fittings could cause distortion of connections, tubes or components.

8. Disconnect condenser tube from reversing valve.



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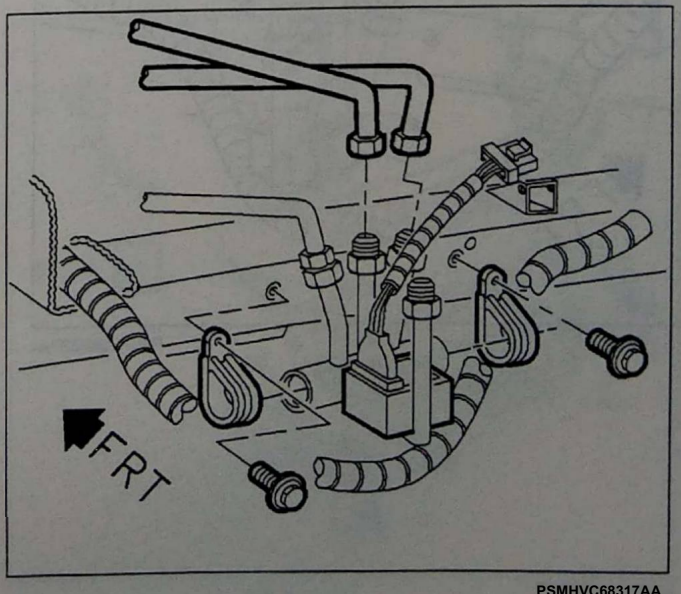
9. Disconnect temperature sensor, if equipped, on the accumulator tube.

10. Disconnect accumulator tube from reversing valve.

D- Remove accumulator tube from vehicle.



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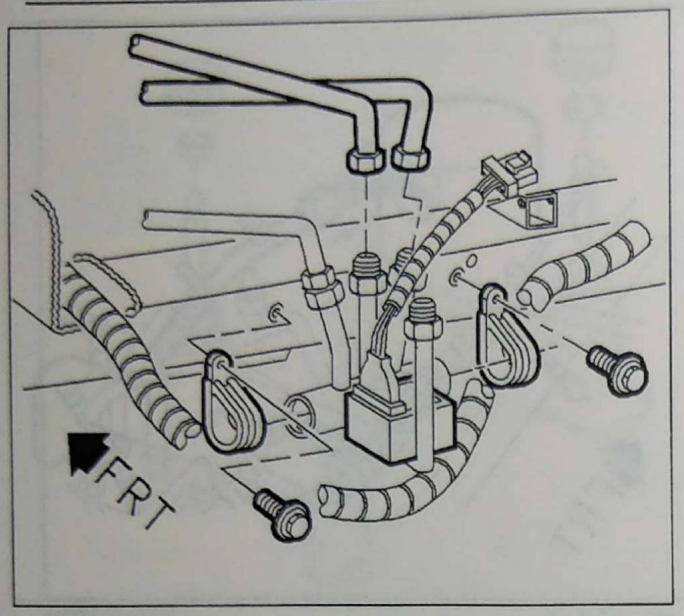

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INSTALLATION

IMPORTANT: If vehicle is equipped with a temperature sensor in the accumulator tube and the replacement accumulator tube does not have a sensor inline, then the condenser tube (reversing valve to condenser) will also need to be replaced. Connect temperature sensor connector to sensor on condenser tube.

1. Remove protective cover from reversing valve fitting of accumulator tube.

NOTICE: Use only R-12 refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

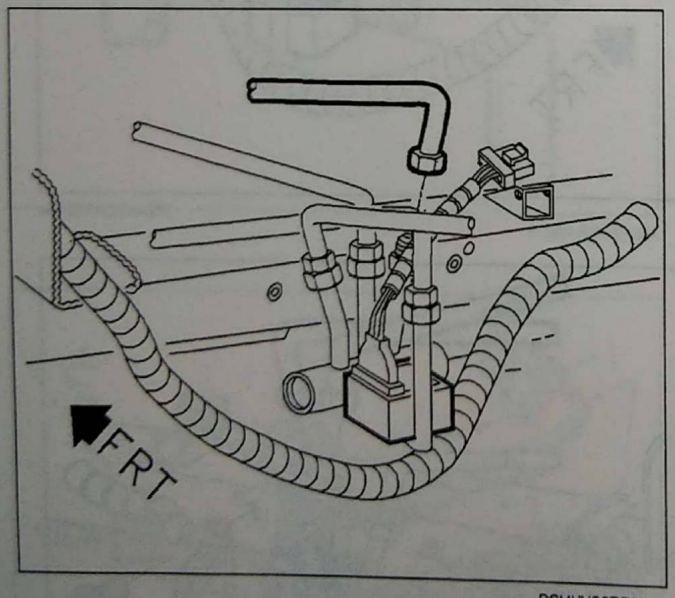
2. Lubricate O-ring with R-12 mineral refrigerant oil.
3. Position accumulator tube in vehicle.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

4. Connect accumulator tube to reversing valve.

Torque: 20 N*m (15 ft—lbs)

5. Remove O-ring from condenser tube fitting and install a new Electric Vehicle approved service replacement O-ring.



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NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate 0-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

6. Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

7. Connect condenser tube to reversing valve.

Torque: 20N*m (15 ft-lbs)

8. Install reversing valve retainers to front lower tie bar.

Torque: 10 N*m (7 ft-lbs)

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"t? move protective cover from accumulator fitting of » accumulator tube.

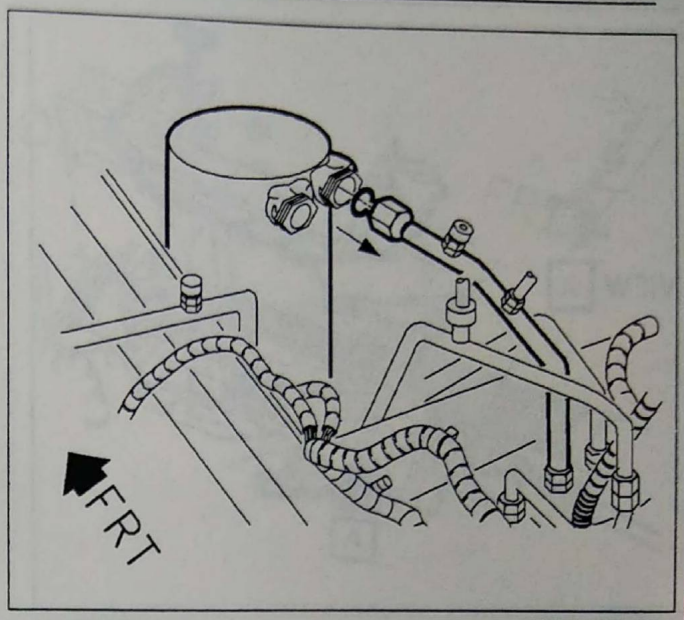
NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

)(1 Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting "hen disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

11 Connect accumulator tube to accumulator.

Torque: 20N«m (15 ft-lbs)



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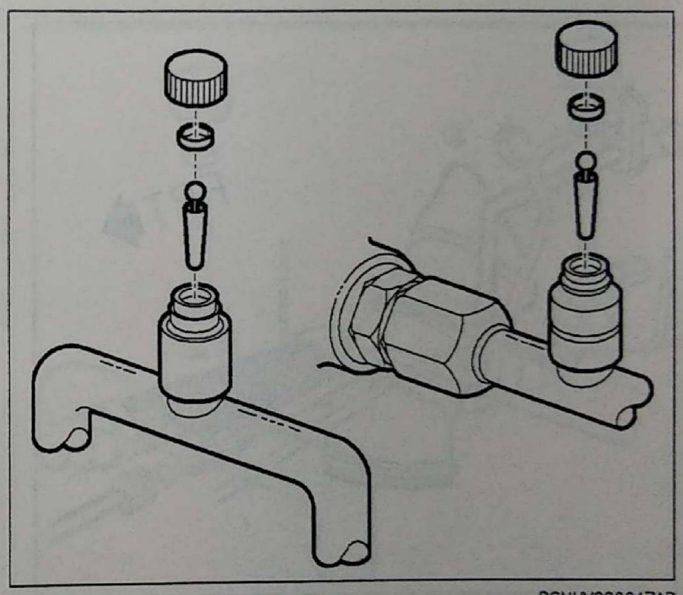
12. Install new Electric Vehicle approved service replacement heat pump schrader valves.
13. Evacuate, charge, and leak test heat pump system.
14. Install power electronics bay. (Refer to “Power Electronics Bay” installation procedure in this manual.)
15. Verify heat pump system operation by performing system performance test.



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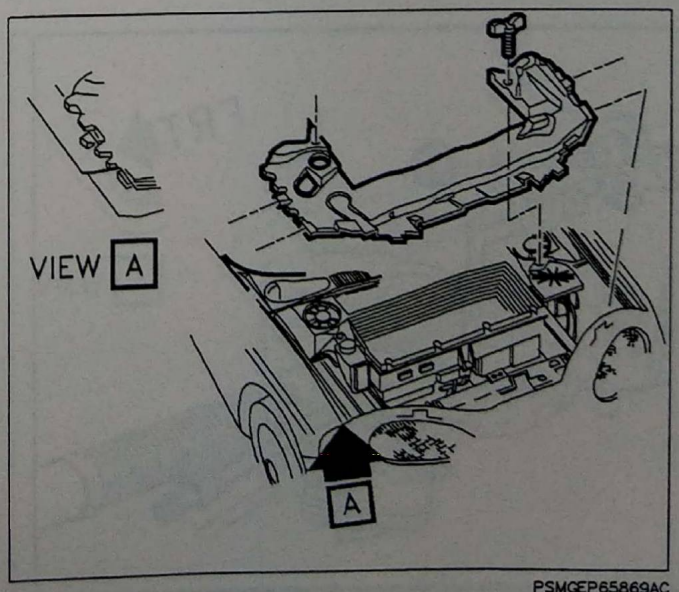
16. Install engine compartment sight shield.



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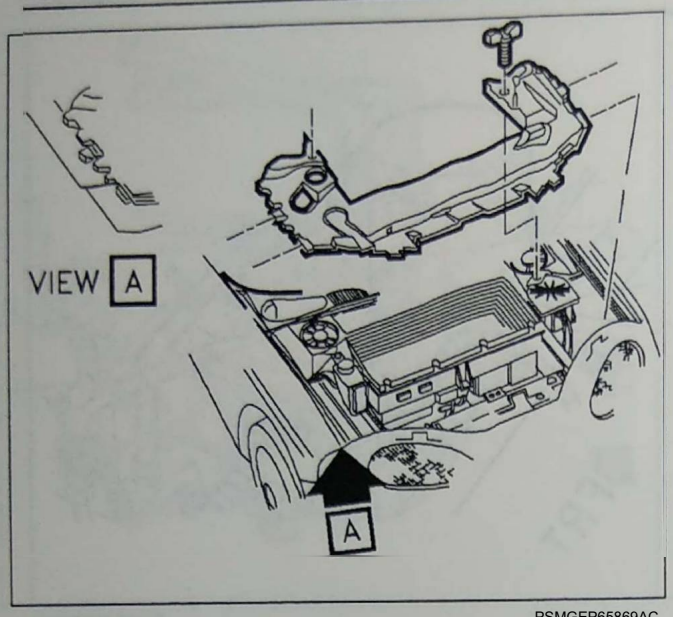

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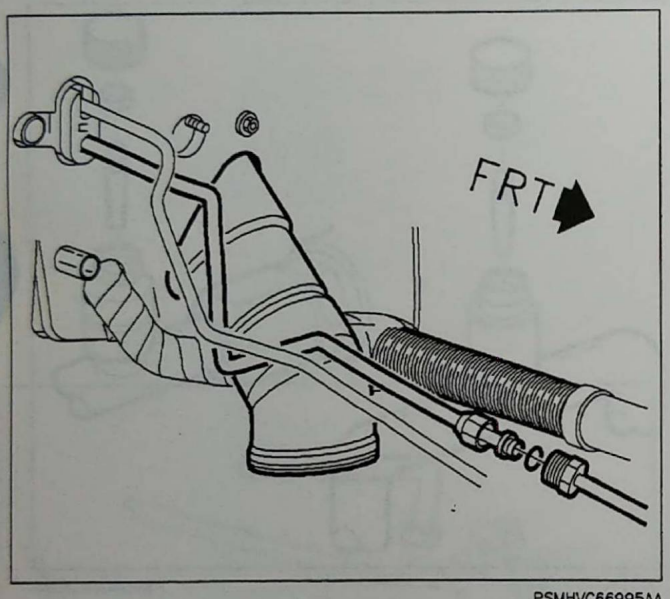
A/C EVAPORATOR TUBE ASSEMBLY

ORIFICE TO EVAPORATOR

REMOVAL

1. Place keypad in “lock” mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.
4. Verify charge coupler is not installed in charger receptacle.
5. Remove power electronics bay. (Refer to “Power Electronics Bay” removal procedure in this service manual.)



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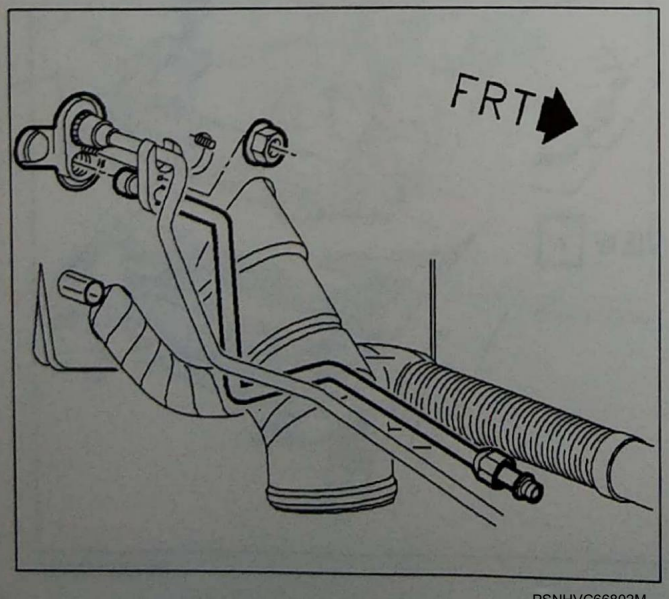
NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

Disconnect evaporator tube at orifice tube fitting.



PSNHVC66802M

6. Remove nut retaining tubes at front of dash.
7. Disconnect evaporator tube from evaporator.
8. Remove evaporator tube from vehicle.

INSTALLATION

1. Remove protective cover from evaporator fitting of evaporator tube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion o fitting joints.

2. Lubricate O-ring with R-12 mineral refrigerant oil-
3. Position evaporator tube in vehicle.

4- Connect evaporator tube to evaporator.

Torque: 16 N*m (12 ft-lbs)

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ve protective cover from orifice tube fitting of
* Orator tube.

NOTICE: Use only R'12 Refrigerant oil (mineral) to Q.rings. Use of R-134a (PAG) oil or R-134a lubricat„ rFster) oil will cause premature corrosion of h^tpUn„ P Points‘ (itting.J

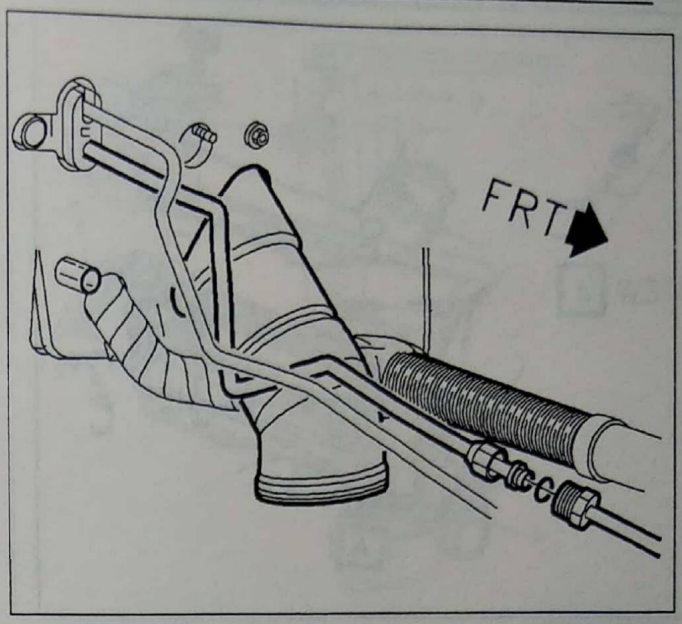
Lubricate O-ring with R-12 mineral refrigerant oil.

6.

NOTICE: Always use a wrench to back up the opposing i (.when disconnecting connections. Failure to use a ^nch to back up fittings could cause distortion of Sections, tubes or components.

7 Connect evaporator tube to orifice tube fitting.

Torque: 20N-m (15 ft-lbs)



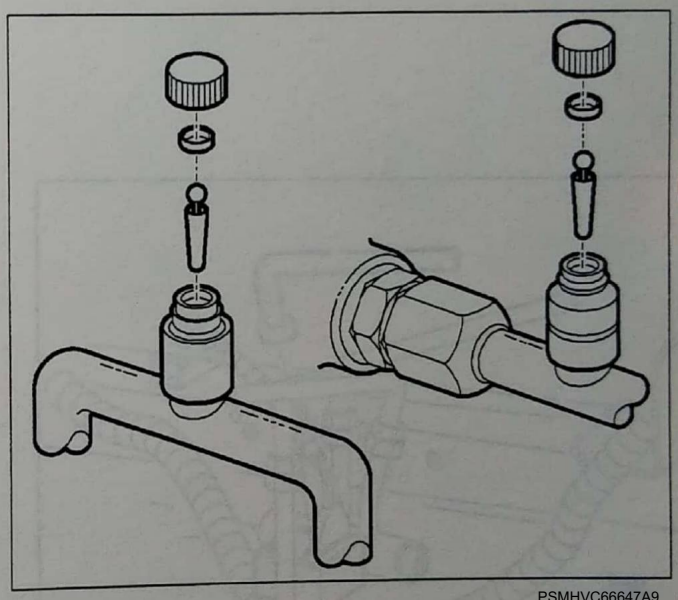
PSMHVC66995M

8. Install new Electric Vehicle approved service replacement heat pump schrader valves.

9. Evacuate, charge, and leak test heat pump system.

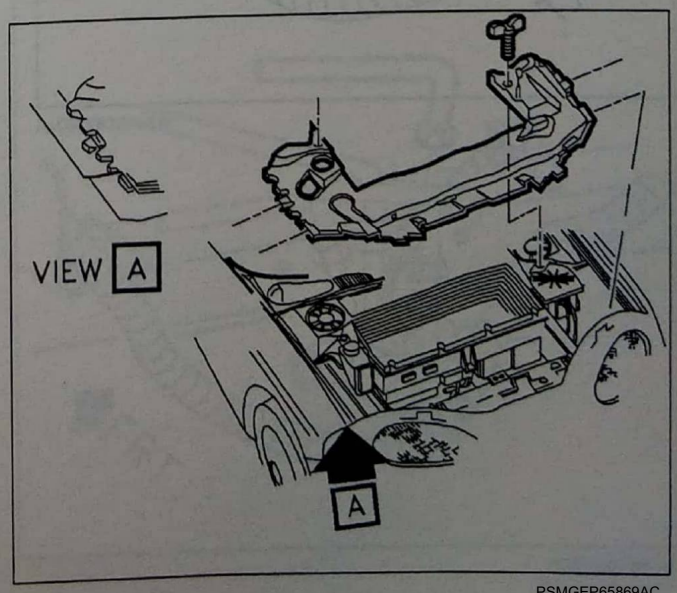
10. Install power electronics bay. (Refer to “Power Electronics Bay” installation procedure in this service manual.)

11. Verify heat pump system operation by performing system performance test.



PSMHVC66647A9

12. Install engine compartment sight shield.



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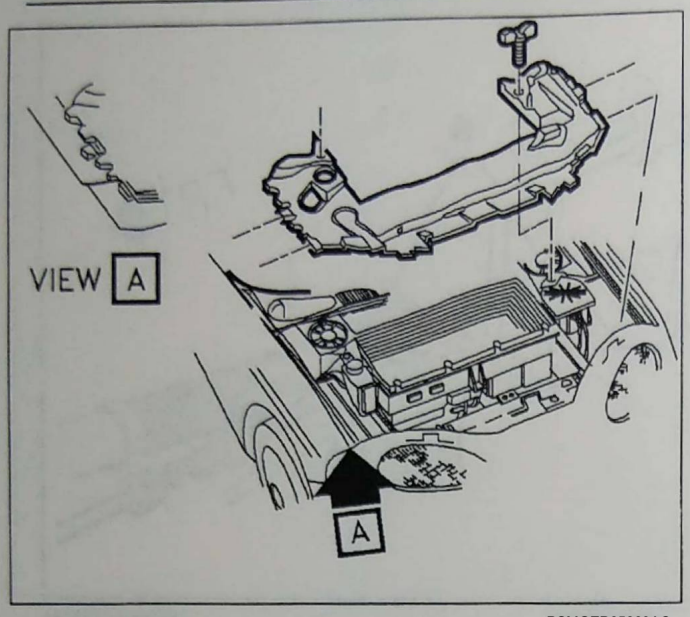


PSMGEP65869AC

A/C CONDENSER TUBE ASSEMBLY

REVERSING VALVE TO CONDENSER

REMOVAL

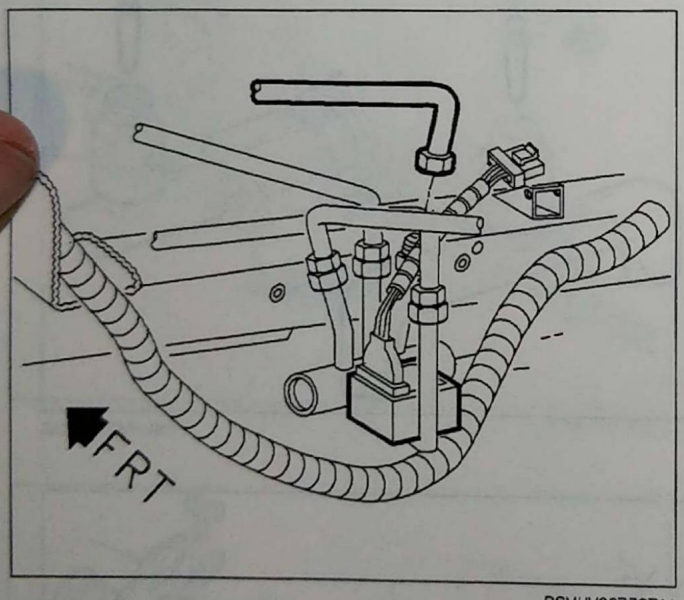
1. Place keypad in “lock” mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.

CAUTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS, THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANY TIME SERVICE WORK IS BEING PERFORMED ON OR AROUND THE HIGH VOLTAGE SYSTEM. WHEN IN DOUBT, ALWAYS DISABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DISABLED.

4. Disable high voltage. (Refer to “High Voltage Disable” procedure in this manual.)
5. Verify charge coupler is not installed in charger receptacle.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

6. Disconnect condenser tube from reversing valve.



PSMHVC67387AA

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Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of tubes or components.

7. Disconnect condenser tube from upper fitting on condenser.
8. Remove condenser tube from vehicle.

INSTALLATION

1. Remove protective cover from condenser fitting of condensertube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. (Use of R-134a (PAG) oil or R-134a heal pump (Ester) oil will cause premature corrosion of fitting joints.

2. Lubricate O-ring with R-12 mineral refrigerant oil.
3. Position condenser tube in vehicle. Route tube under accumulator tube and over the reversing valve tube.

NOTICE: Always use a wTench to back up the opposing fitting when disconnecting connections. Failure to use a *Tencb to back up fittings could cause distortion of connections, tubes or components.

4. Connect condenser tube to upper fitting on condenser.

Torque: 20 N*m (15 ft —lbs)

5. Remove protective cover from reversing valve fitting of condenser tube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. (Use of R-134a (PAG) oil or R-134a beat pump (Ester) oil will cause premature corrosion of Utting joints.

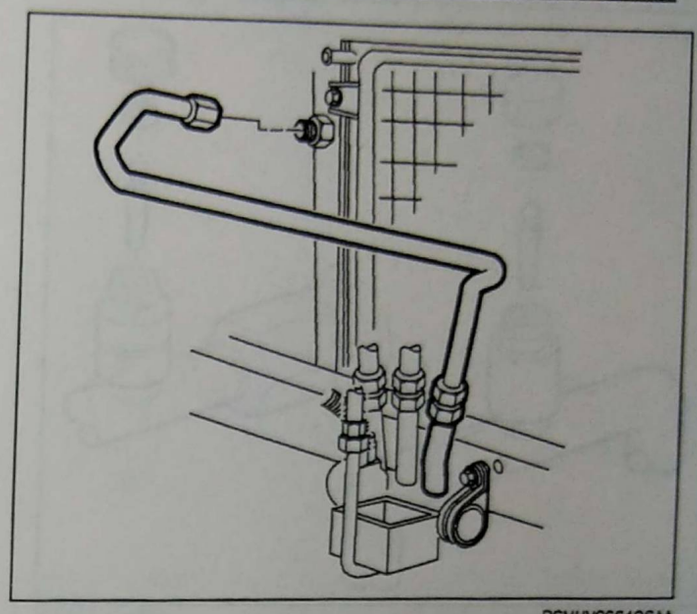
6. Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections. tubes or components.

7. Connect condenser tube to reversing valve.

Torque: 20 N*m (15 ft—lbs)

8. Enable high voltage. (Refer to “High Voltage Enable” procedure in this manual.)



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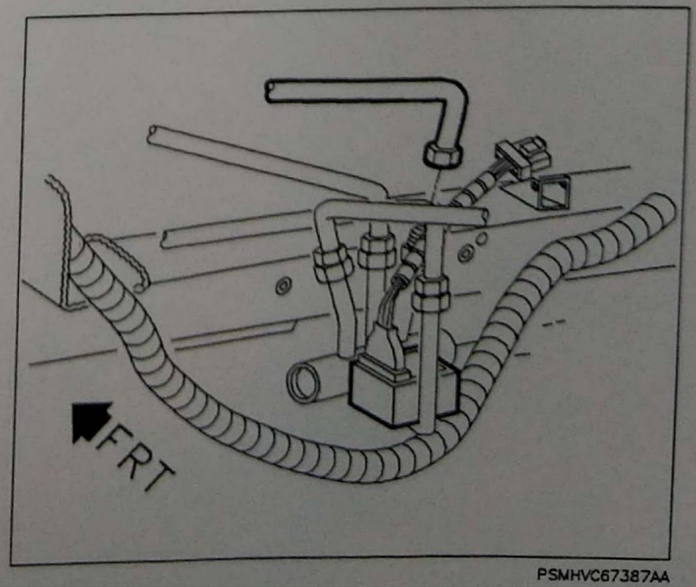

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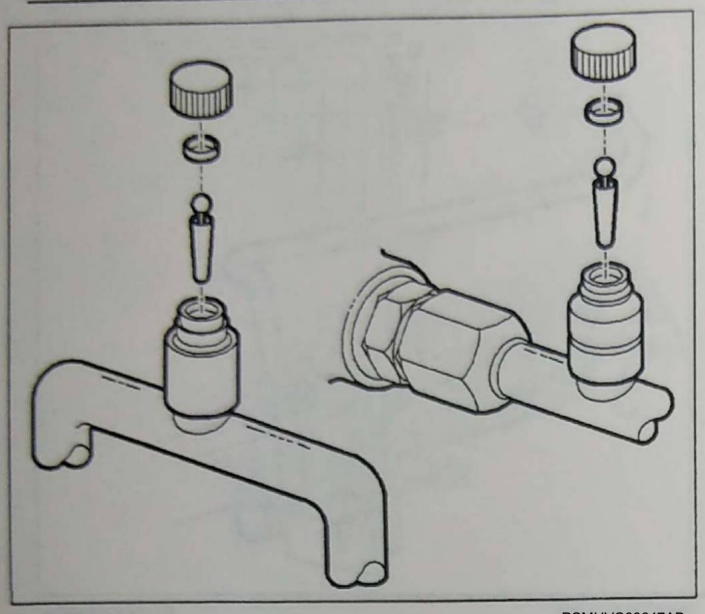
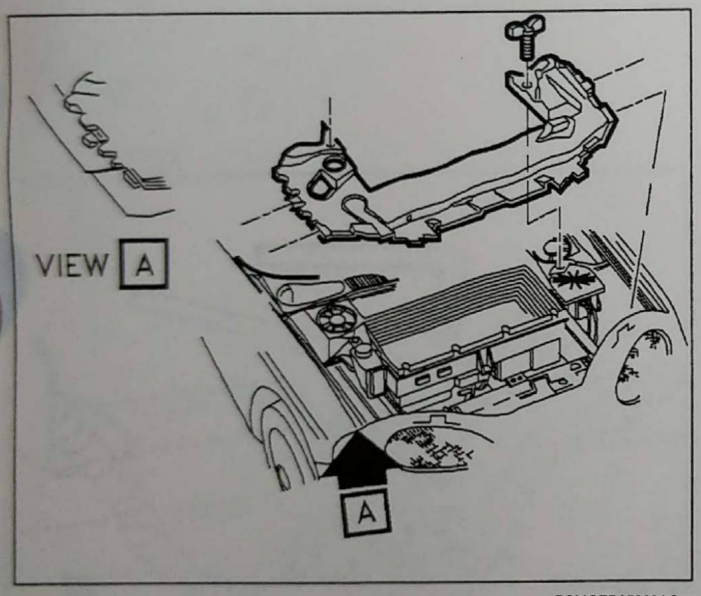


PSMHVC66647AB

9. Install new Electric Vehicle approved service replacement heat pump schrader valves.
10. Evacuate, charge, and leak test heat pump system.
11. If new condenser tube has a temperature sensor in line, connect temperature sensor connector.
12. Verify heat pump system operation by performing system performance test.



PSMGEP65869AC

13. Install engine compartment sight shield.

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^/C CONDENSER TUBE ASSEMBLY

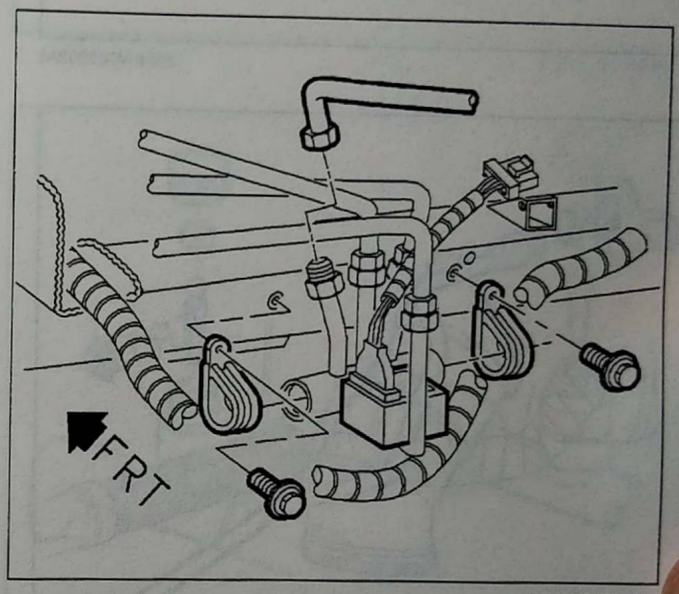
^VERSING VALVE TO EVAPORATOR

REMOVAL

1. place keypad in “lock" mode.
9. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery' system.
4. Verify'charge coupler is not installed in charger receptacle.
5. Remove power electronics bay. (Refer to “Power Electronics Bay” removal procedure in this service manual.)

NOTICE: .Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

6. Disconnect condenser tube from reversing valve.



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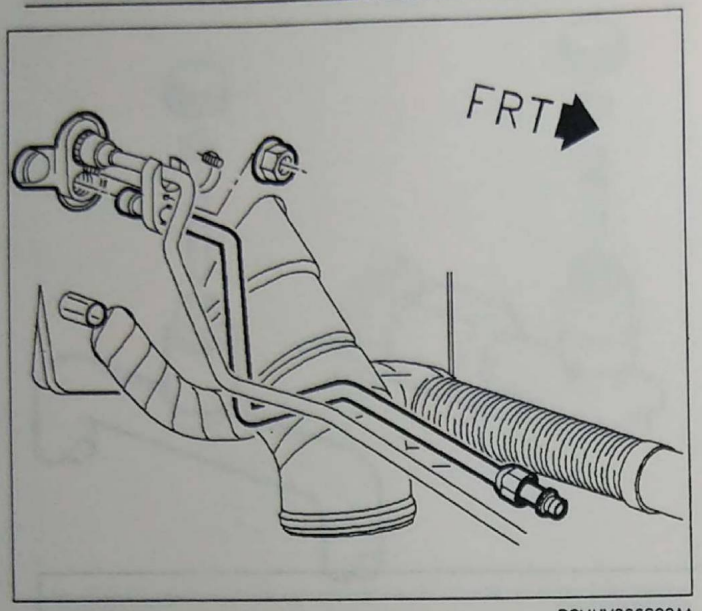
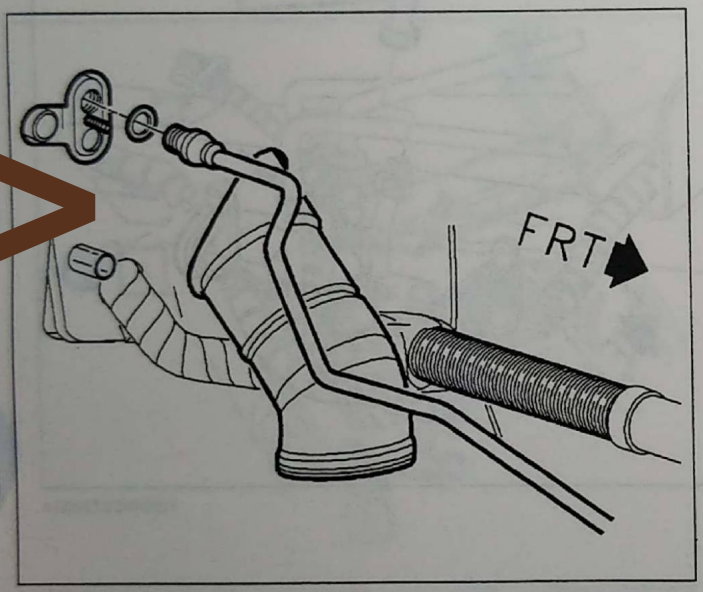


PSMHVC66802AA

7. Remove nut retaining tubes at front of dash.
8. Disconnect evaporator tube from evaporator.



PSMHVC66994-AA

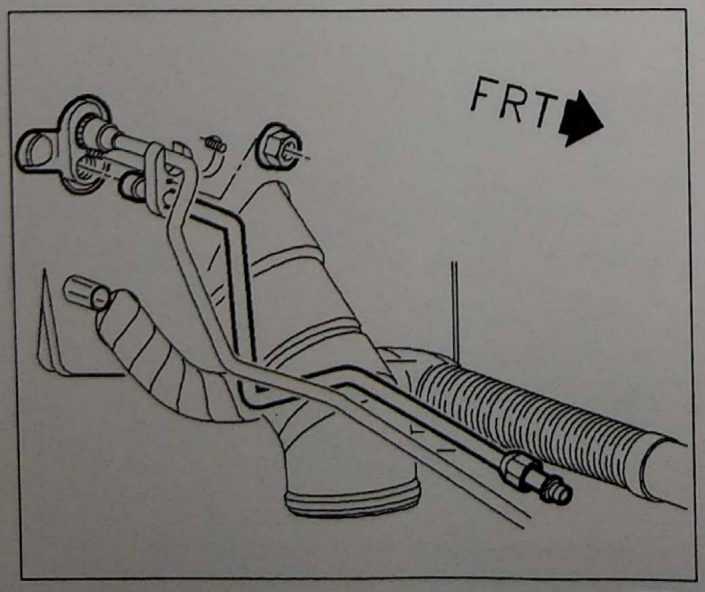
9. Disconnect condenser tube from evaporator.
10. Remove condenser tube from vehicle.

INSTALLATION

1. Remove protective cover from evaporator fitting of condenser tube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

2. Lubricate O-ring with R-12 mineral refrigerant oil.
3. Position condenser tube in vehicle.
4. Connect condenser tube to evaporator.



PSMHVC66802AA

5. Remove O-ring from evaporator tube and install a new genuine electric vehicle approved service replacement O-ring.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

6. Lubricate O-ring with R-12 mineral refrigerant oil.
7. Connect evaporator tube to evaporator.
8. Install evaporator tube nut and tighten.

Torque: 16 N*m (12ft-lbs)

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->Tniove protective cover from reversing valve fitting 9 Of condenser tube.

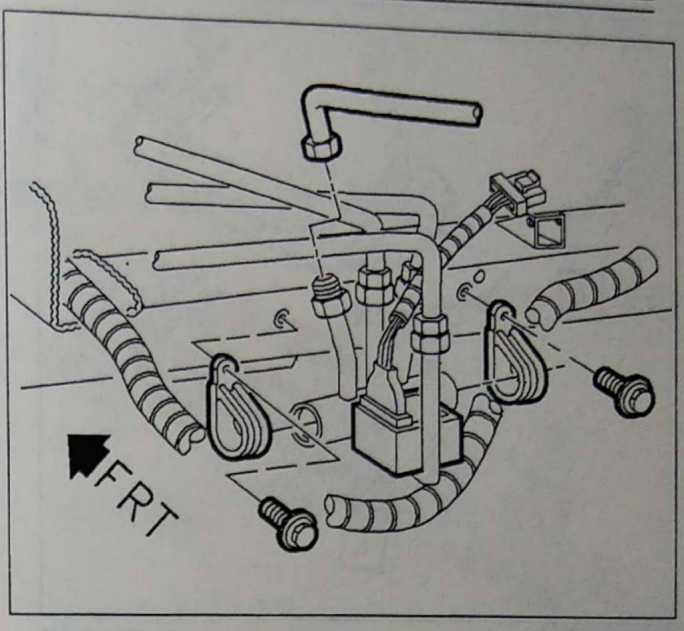
NOTICE: Use only R-12 Refrigerant oil (minpran . Trieste 0-nngs Use of R-!34a (PAG) oil or R-134a hffll pump (Ester) o.l W|| cause premature corrosion nf fitting j<"nts- MOn of

id Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a jirench to back up fittings could cause distortion of connections, tubes or components.

jl. Connect condenser tube to reversing valve.

Torque: 20N*m (15 ft—lbs)



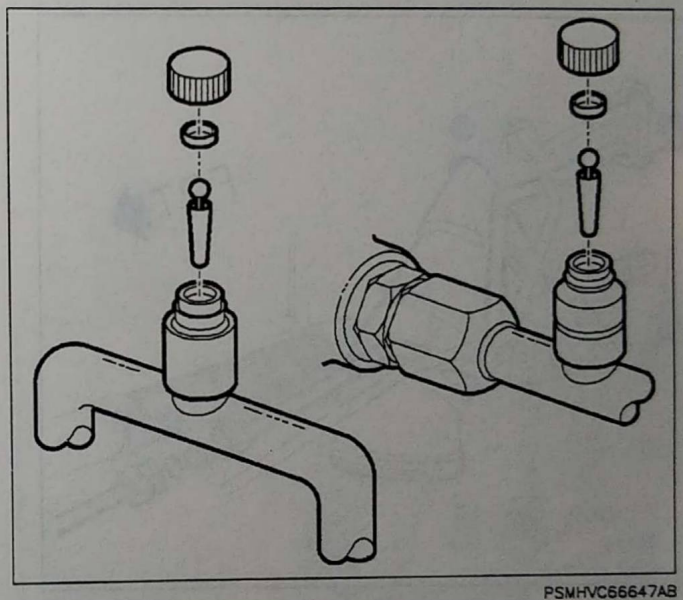
PSMHVC67385M

12. Install new genuine electric vehicle approved service replacement heat pump schrader valves.

13. Evacuate, charge, and leak test heat pump system.

14. Install power electronics bay. (Refer to "Power Electronics Bay" installation procedure in this service manual.)

15. Verify heat pump system operation by performing system performance test.



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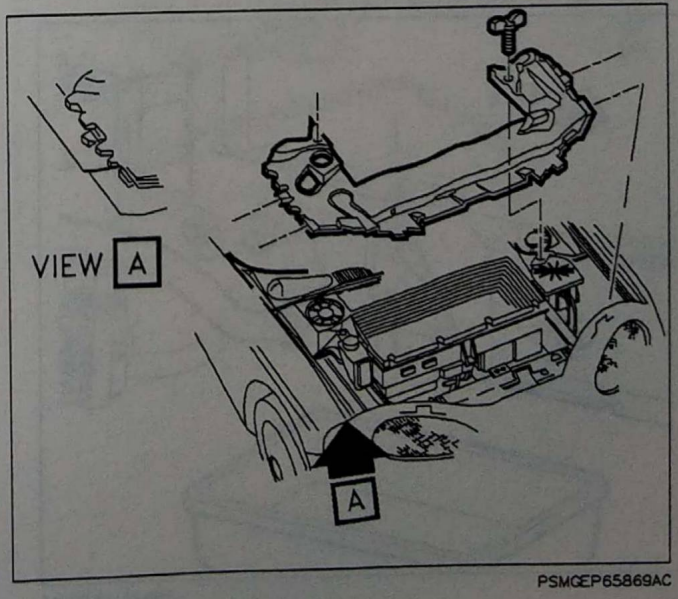
16. Install engine compartment sight shield.



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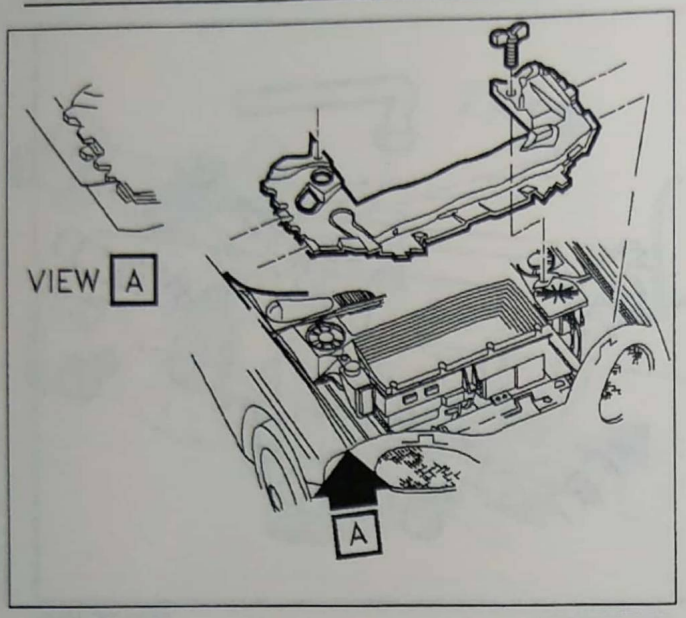


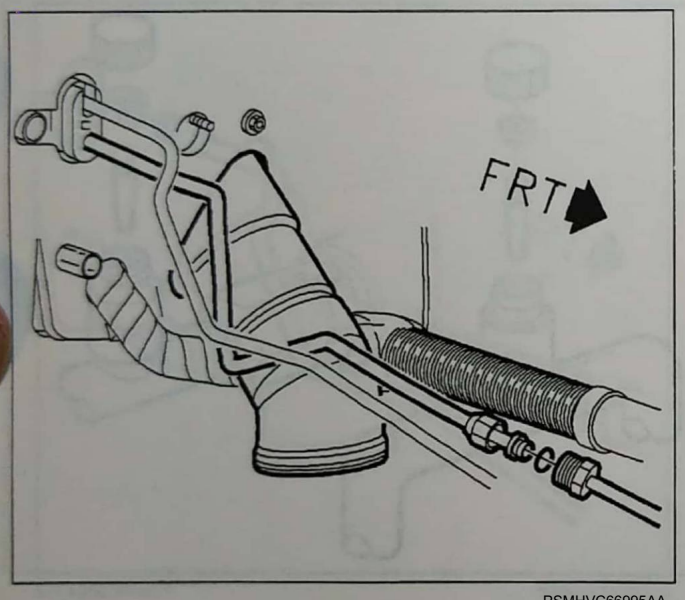
PSMGEP65869AC

A/C REFRIGERANT ORIFICE TUBE ASSEMBLY

CONDENSER TO ORIFICE TUBE

REMOVAL

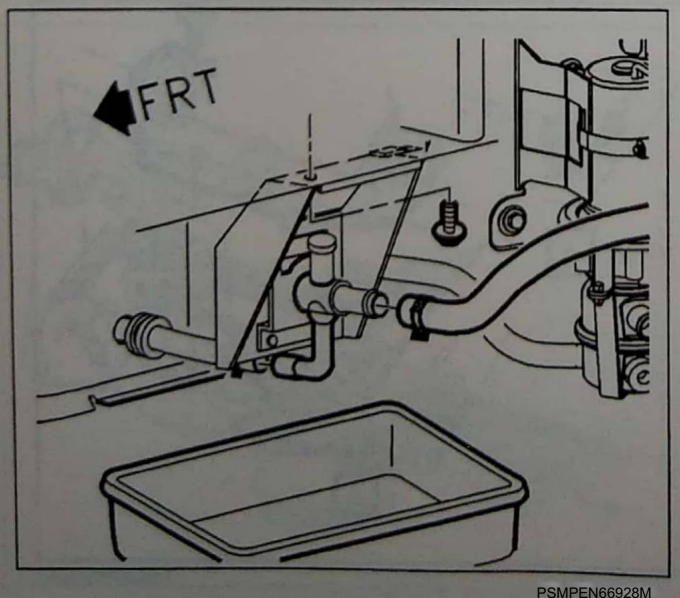
1. Place keypad in “lock” mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.
4. Verify charge coupler is not installed in charger receptacle.
5. Remove power electronics bay. (Refer to “Power Electronics Bay” removal procedure in this service manual.)



PSMHVC66995AA

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

6. Disconnect orifice tube at orifice tube fitting.
7. Raise vehicle on hoist.



PSMPEN66928M

8. Disconnect the charger receptacle inlet hose from charger receptacle coolant valve.

IMPORTANT: Coolant will flow from both the hose and the valve fitting.

9. Remove fasteners retaining charger receptacle coolant valve, and position valve out of way.

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E: Always use a WTench to back up the opposing ^oTlC hen disconnecting connections. Failure to use a fil'ing h "to back up fittings could cause distortion of jjtions, tubes or components.

p Disconnect orifice tube from lower condenser fitting.

n ^-er vehicle on hoist.

.. Remove orifice tube from vehicle.

INSTALLATION

1. Remove protective cover from condenser fitting of orifice tube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fittingjoints.

2. Lubricate O-ring with R-12 mineral refrigerant oil.
3. Position orifice tube in vehicle.
4. Raise vehicle on hoist.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

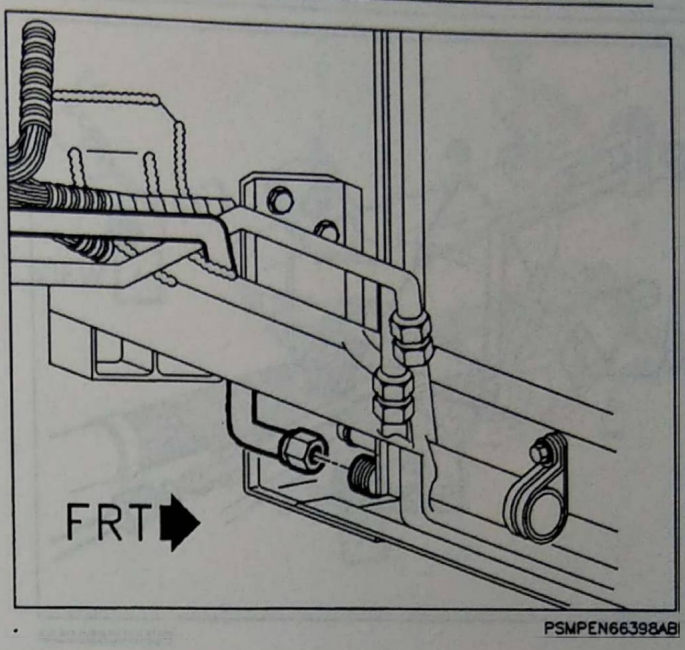
5. Connect orifice tube to condenser lower fitting.

Torque: 20 N*m (15 ft—lbs)

6. Install charger receptacle valve tab into slot in left hand mid-rail, slide valve forward and install valve bolt.

T^que: 10 N*m (7 ft-lbs)

7. • Install charger receptacle inlet hose to charger receptacle coolant valve. Position clamp tangs to 6 o'clock.
8. Lower vehicle on hoist.



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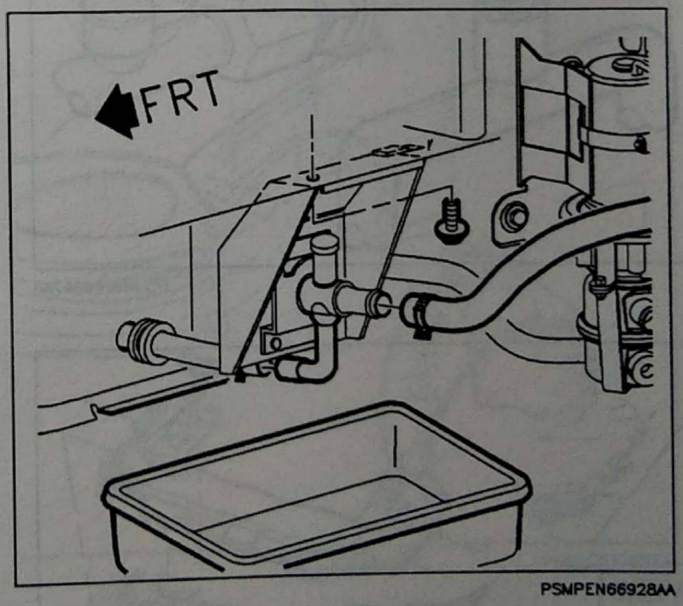

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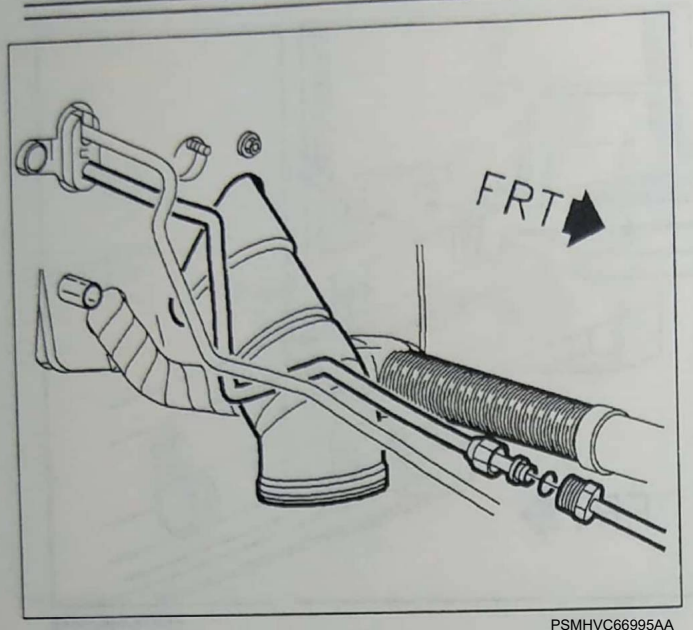


PSMHVC66995AA

9. Remove protective cover from orifice tube fitting of orifice tube.

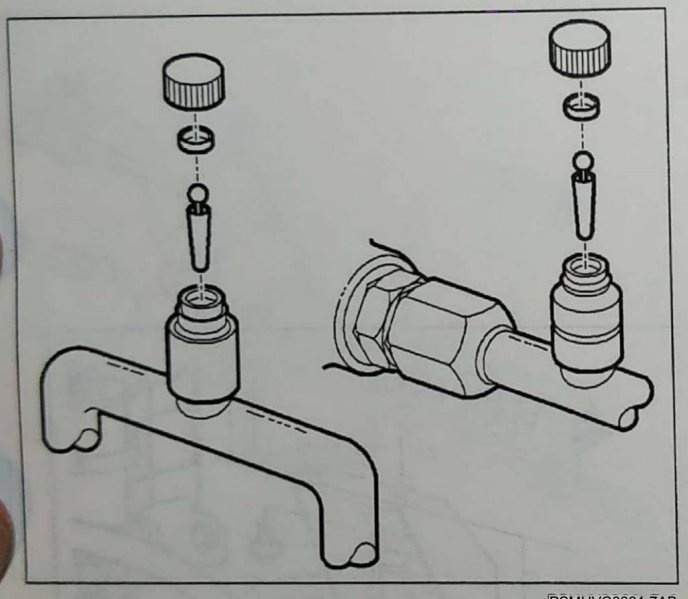
NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. (Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of Fitting joints.

10. Lubricate O-ring with R-12 mineral refrigerant oil.

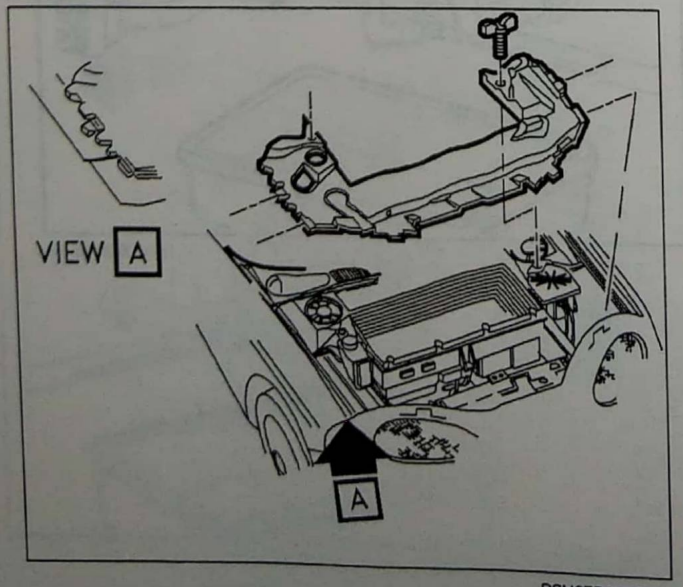
NOTICE: Always use a wrench to back up the opposing Fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

11. Connect orifice tube to orifice tube fitting.

Torque: 20 N«m (15 ft—lbs)


PSMHVC6664-7AB

12. Install new genuine electric vehicle approved service replacement heat pump schrader valves.
13. Evacuate, charge, and leak test heat pump system.
14. Install power electronics bay. (Refer to “Power Electronics Bay” installation procedure in this service manual.)
15. Verify heat pump system operation by performing system performance test.



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16. Install engine compartment sight shield.

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^PRESSOR SUCTION TUBE ASSEMBLY

ACCUMULATOR TO COMPRESSOR

REMOVAL

Place keypad in "lock" mode.

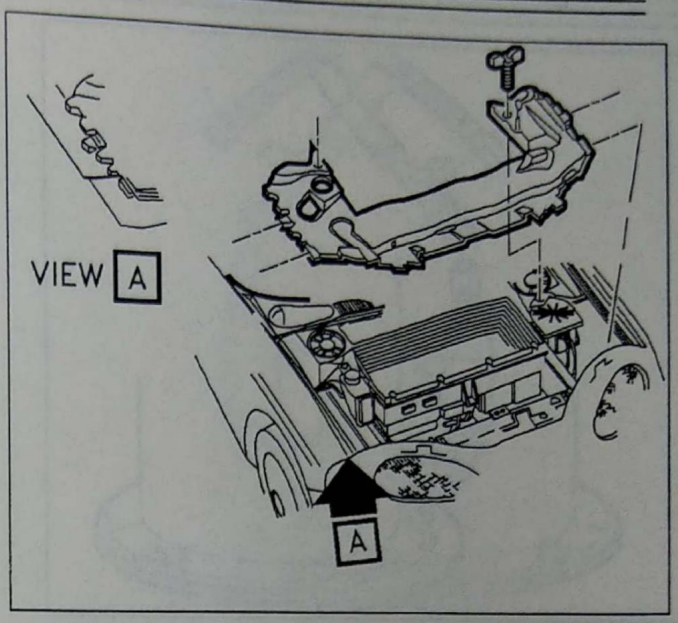
1.

, Remove engine compartment sight shield.

3. Recover refrigerent using an approved refrigerant recoveiy system.

rilTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS, THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANY TIME SERVICE WORK IS BEING PERFORMED ON OR AROUND THE HIGH VOLTAGE SYSTEM. WHEN IN DOUBT. ALWAYS DIS ABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DIS.ABLED.

4. Disable high voltage. (Refer to "High Voltage Disable" procedure in this manual.)
5. Verify charge coupler is not installed in charger receptacle.
6. Raise vehicle on hoist. (Refer to "Lifting and Jacking Support Points" in this service manual.)
7. Remove left front wheel house liner.



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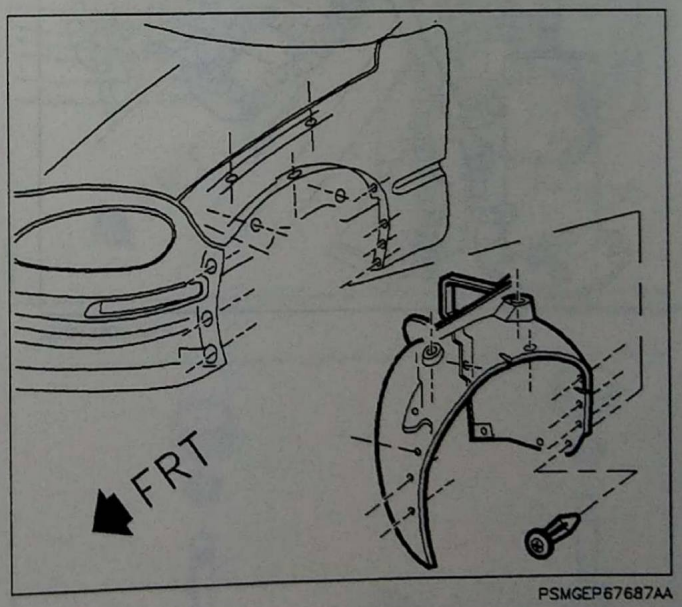

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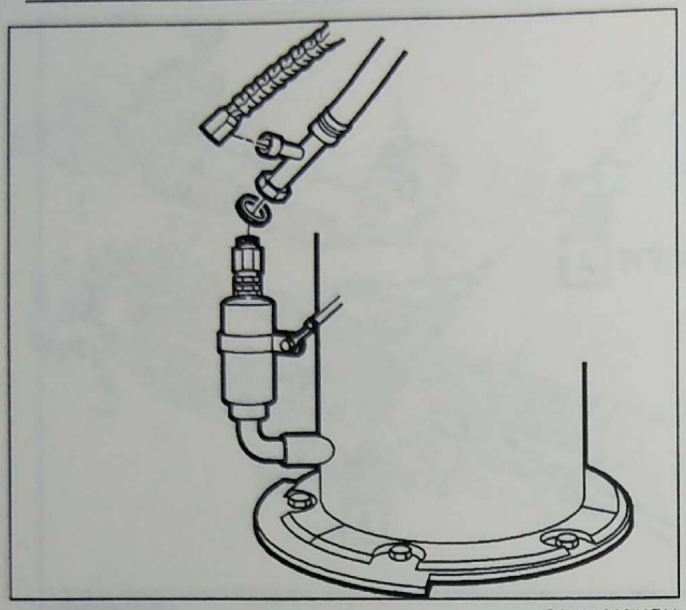


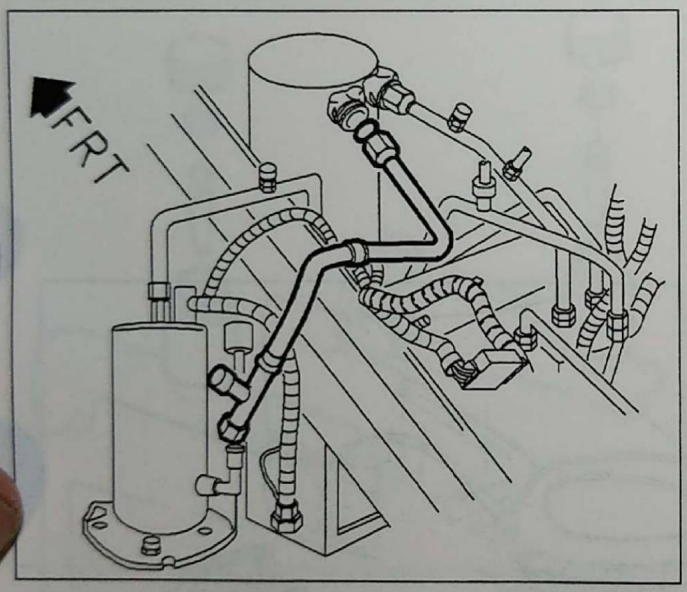
PSMHVC66497AA

8. Disconnect low pressure transducer electrical connector.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

9. Disconnect suction tube from heat pump compressor.

10. Lower vehicle on lift.



PSMHVC66498AA

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

11. Disconnect suction tube from accumulator.

12. Remove suction tube from vehicle.

INSTALLATION

1. Remove protective cover from accumulator fitting of suction tube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

2. Lubricate O-ring with R-12 mineral refrigerant oil.

3. Position suction tube in vehicle. Route tube over the left side mid-rail and under the compressor wire and connector.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

4. Connect suction tube to accumulator.

Torque: 20 N*m (15 ft-lbs)

5. Raise vehicle on hoist.

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6. Remove protective cover from compressor fitting of suction tube.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections. tubes or components.

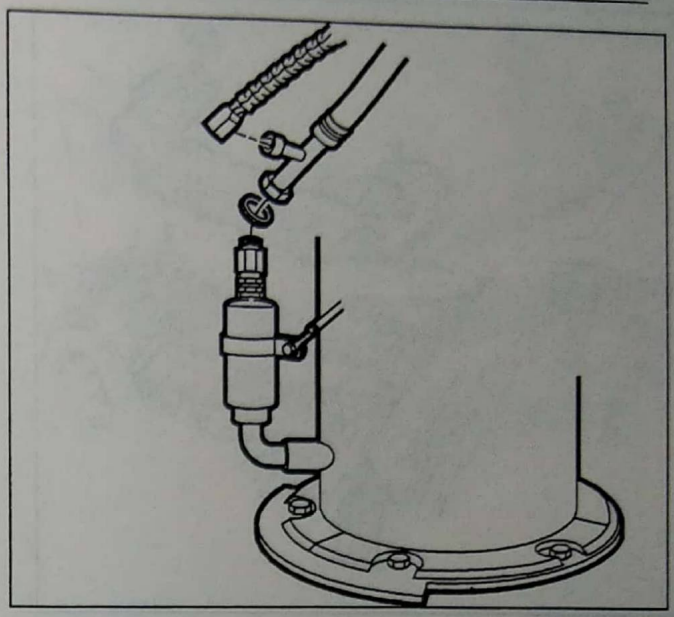
NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a (Ester) oil will cause premature corrosion of fittings joints.

- Lubricate O-ring with R-12 mineral refrigerant oil.

7. Connect suction tube to compressor.

Torque: 20N*m (15 ft-lbs)

9. Connect low pressure transducer electrical connector.



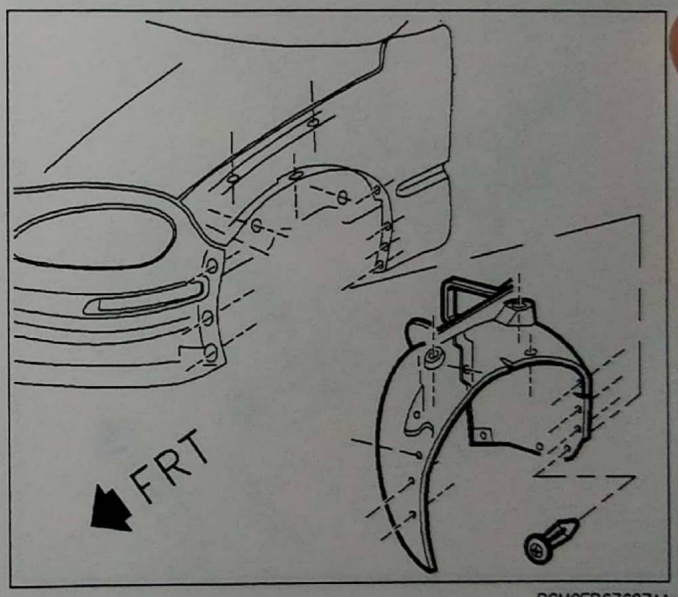
PSMHVC66497AA

10. Install left front wheel house liner.

Torque: 6N*m (53 in-lbs)

11. Lower vehicle on lift.

12. Enable high voltage. (Refer to "High Voltage Enable'" procedure in this manual.)

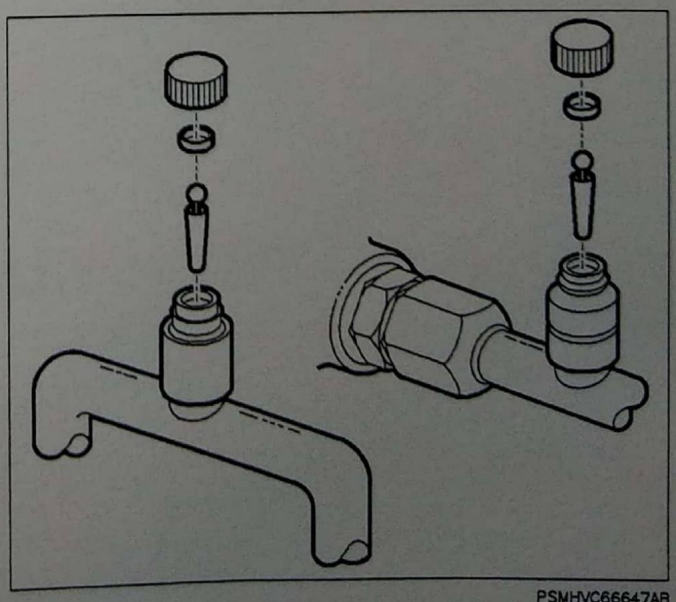


PSMGEP67687AA

13. Install new Electric Vehicle approved service replacement heat pump schrader valves.

14. Evacuate, charge, and leak test heat pump system.

15. Verify heat pump system operation by performing system performance test.



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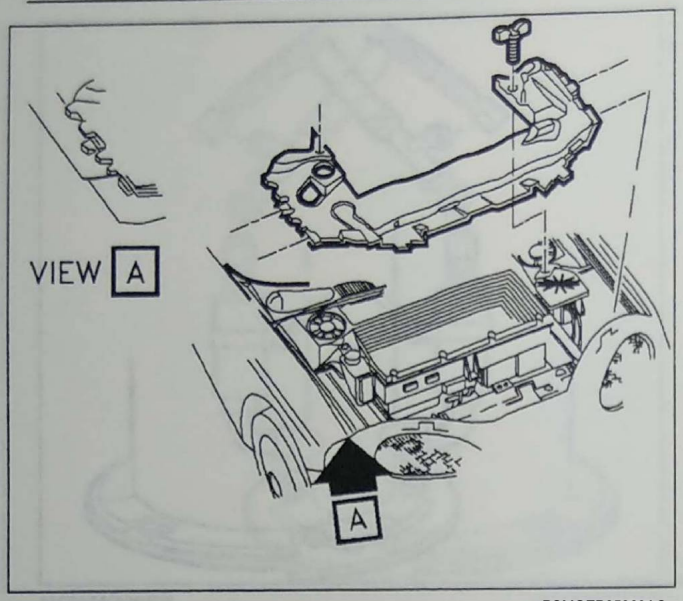

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16. Install engine compartment sight shield.

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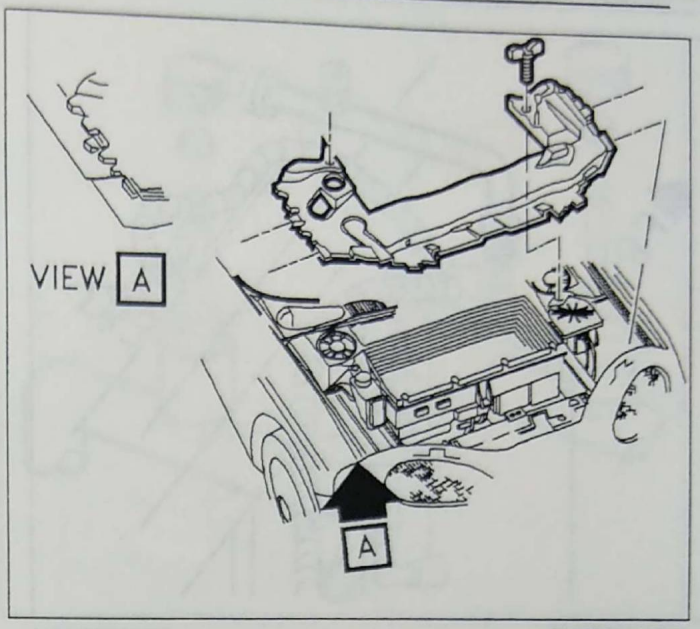
>R|GERANT REVERSING VALVE ASSEMBLY (DISCHARGE TUBE fUBE)

PARSING VALVE TO COMPRESSOR

REMOVAL

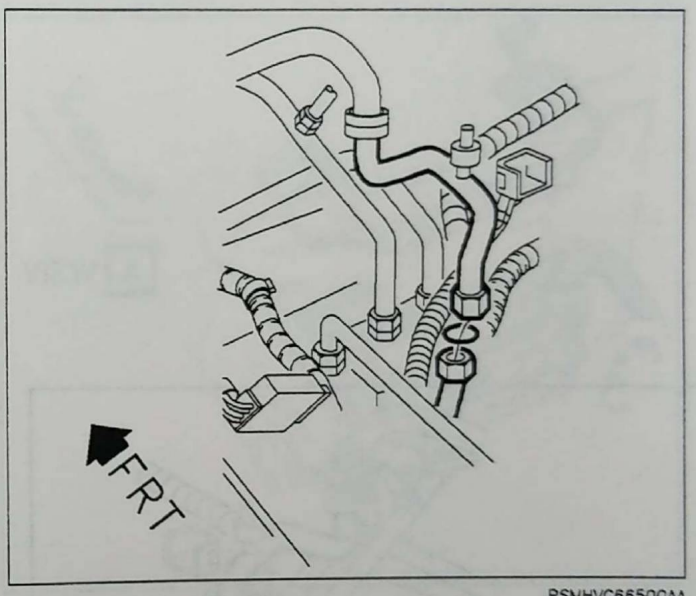
1. Place keypad in “lock" mode.
2. , RemOve engine compartment sight shield.
3. ; R$_{eC}$over refrigerant using an approved refrigerant recover}' system.
4. Verify charge coupler is not installed in charger receptacle.
5. Remove power electronics bay. (Refer to “Power Electronics Bay" removal procedure in this manual.)



PSMGEP65869AC

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

6. Disconnect reversing valve tube from reversing valve.
7. Disconnect high pressure transducer connector.



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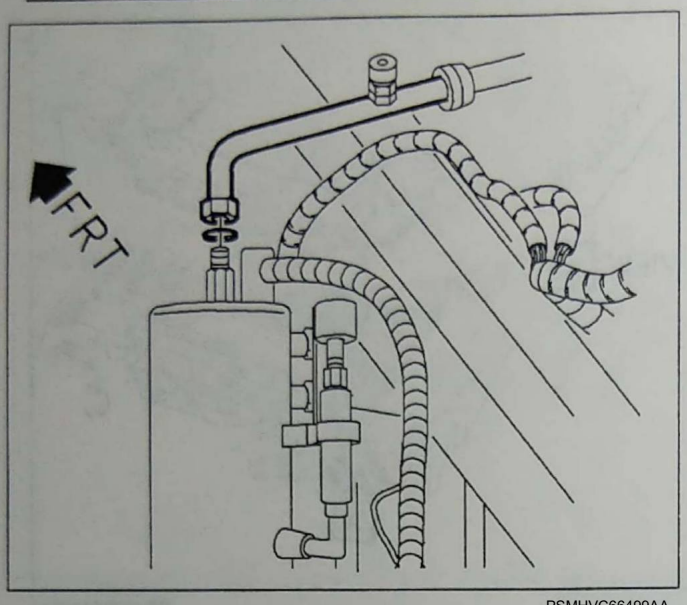


PSMHVC66499AA

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

8. Disconnect reversing valve tube from heat pump compressor.
9. Remove reversing valve tube from vehicle.

INSTALLATION

1. Remove protective cover from compressor fitting of reversing valve tube.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

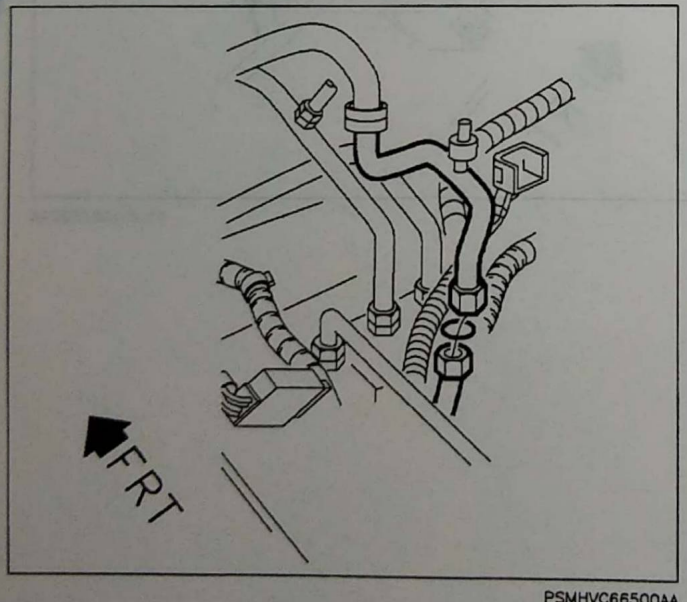
2. Lubricate O-ring with R-12 mineral refrigerant oil.
3. Position reversing valve tube in vehicle.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

4. Connect reversing valve tube to heat pump compressor.

Torque: 20 N*m (15 ft—lbs)

5. Remove protective cover from reversing valve fitting of reversing valve tube.



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NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

6. Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

7. Connect reversing valve tube to reversing valve.

Torque: 20 N*m (15ft-lbs)

8. Connect high pressure transducer connector.

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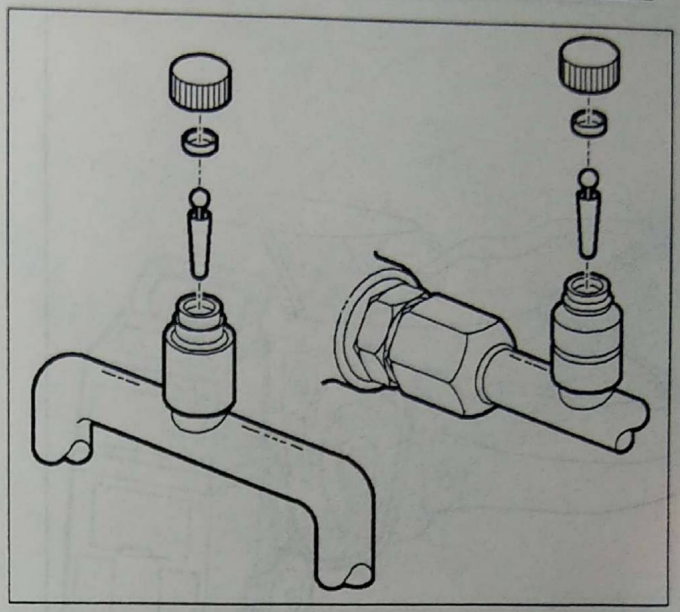
o Install new Electric Vehicle approved service ^placement heat pump schrader valves

10 *Evacuate,* charge, and leak test heat pump system

11. install power electronics bay. (Refer to "Power Electronics Bay installation procedure in this manual.)

12. Verify heat pump system operation by performing system performance test.



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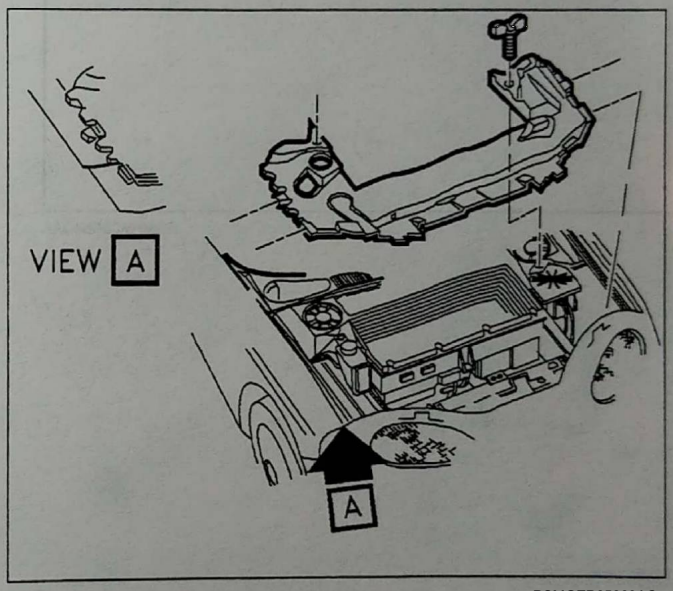
13. Install engine compartment sight shield.



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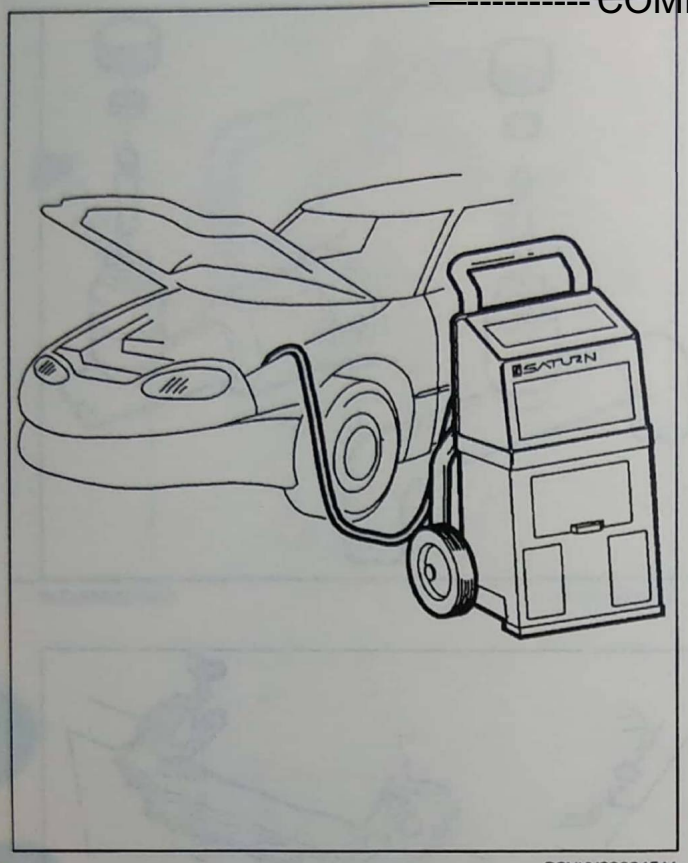


PSMHVC66645AA

COMPRESSOR

REMOVAL

NOTICE: When servicing the compressor, keep dirt and foreign material from getting on or into the compressor parts or system. Clean tools and a clean work area are important for proper service. The compressor connections and the outside of the compressor should be cleaned before any on car repairs, or before removal of the compressor. The parts must be kept clean at all times and any parts to be assembled should be cleaned with a non-petroleum base solvent and dried with air. Use only lint free cloths to wipe parts. Do not allow solvent to enter compressor or lines.

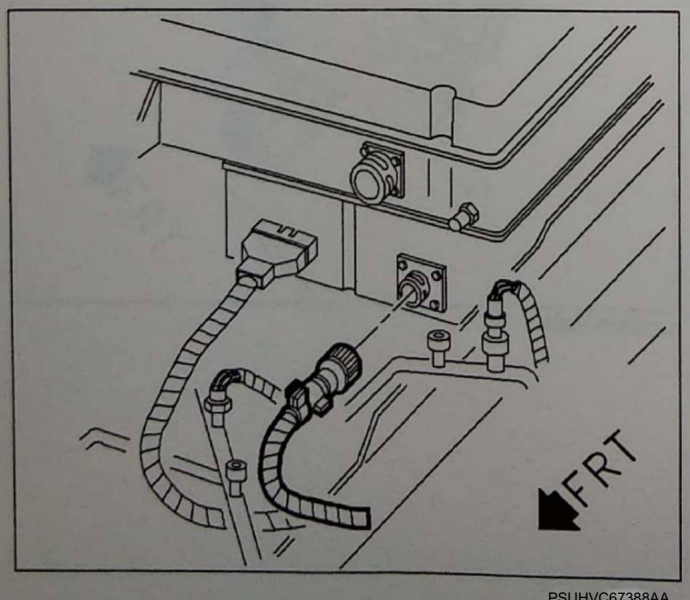
1. Place keypad in "lock" mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.
4. Measure the amount of oil lost during recovery and record.

IMPORTANT: Add the recorded amount of new Electric Vehicle Ester compressor oil before charging the system.

5. Verify charge coupler is not installed in charger receptacle.

CAUTION: TO REDUCE THE RISK OF SEVERE SHOCKS AND BURNS, THE HIGH VOLTAGE SYSTEM SHOULD BE DISABLED ANY TIME SERVICE WORK IS BEING PERFORMED ON OR AROUND THE HIGH VOLTAGE SYSTEM. WHEN IN DOUBT, ALWAYS DISABLE THE HIGH VOLTAGE SYSTEM. THE 12 VOLT SYSTEM WILL STILL BE ACTIVE AFTER THE HIGH VOLTAGE SYSTEM HAS BEEN DISABLED.

6. Disable high voltage. (Refer to "High Voltage Disable" procedure in this manual.)
7. Disconnect compressor electrical cannon connector from PIM.



PSUHVC67388AA

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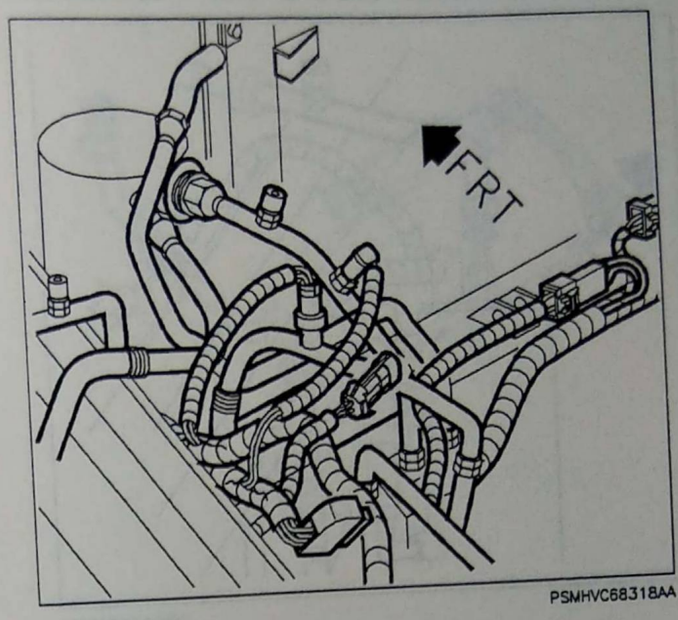
8. Disconnect ground sensing harness connector.
9. Raise vehicle on hoist. (Refer to "Lifting and Jacking Support Points" in this manual.)



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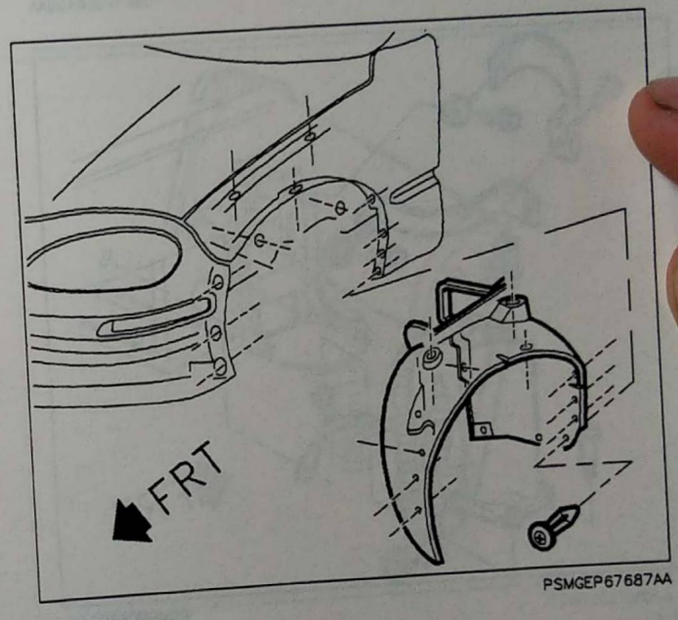
10. Remove left front wheel house liner.



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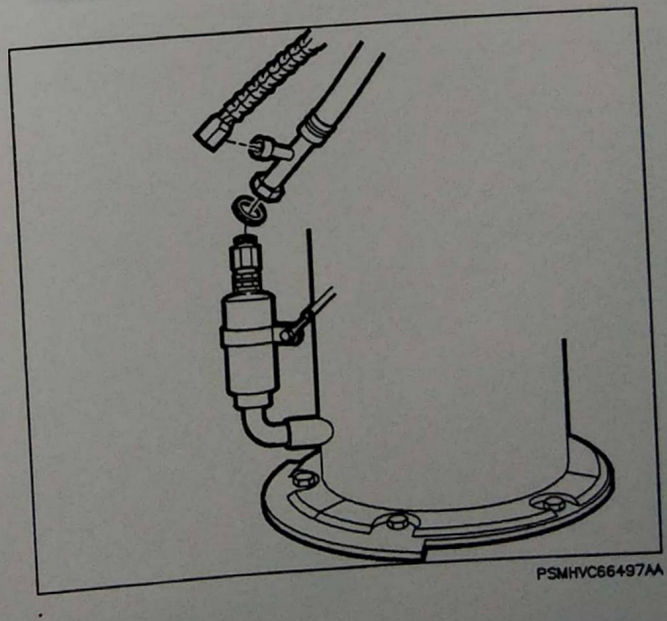
11. Disconnect low pressure transducer electrical connector.

NOTICE: Always use a wrench to back up fitting when disconnecting connection fitting. Failure to use wrench to back up fittings could cause fitting distortion connections, tubes or components.

12. Disconnect suction tube from heat pump compressor.
13. Install plastic bag on the open end of suction tube.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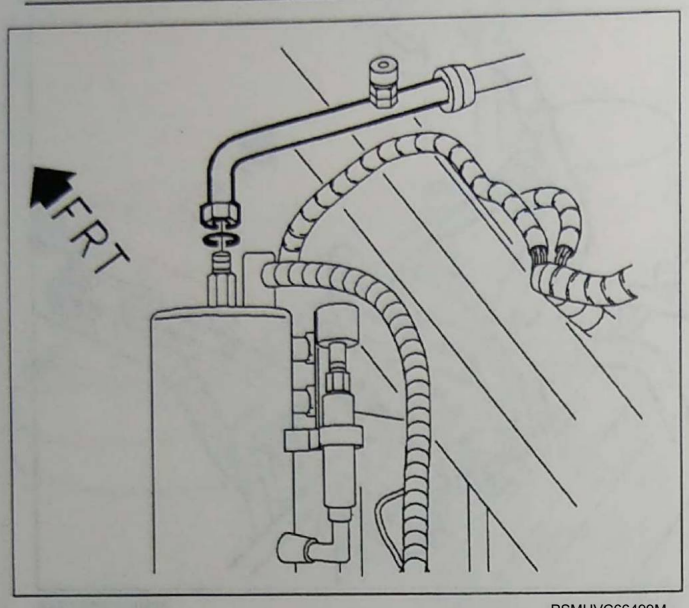
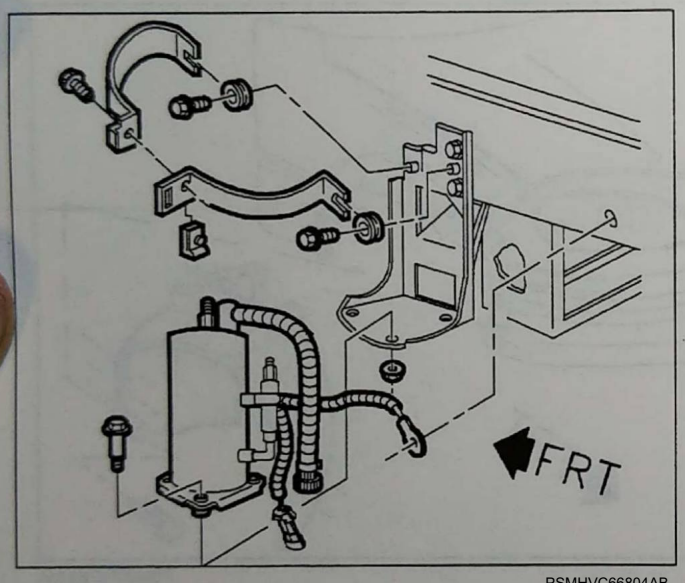


PSMHVC66499M

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

14. Disconnect reversing valve tube from heat pump compressor.
15. Install plastic bag on the open end of reversing valve tube.



PSMHVC66804AB

16. Remove ground strap bolt from left front mid rail.
17. Remove compressor band bracket bolt.
18. Remove compressor to mounting bracket bolts and nuts.
19. Remove compressor band bracket from compressor mounting bracket by sliding band bracket forward on insulators.
20. Remove compressor from vehicle.

IMPORTANT: Keep compressor level during removal to avoid any oil loss from the compressor ports.

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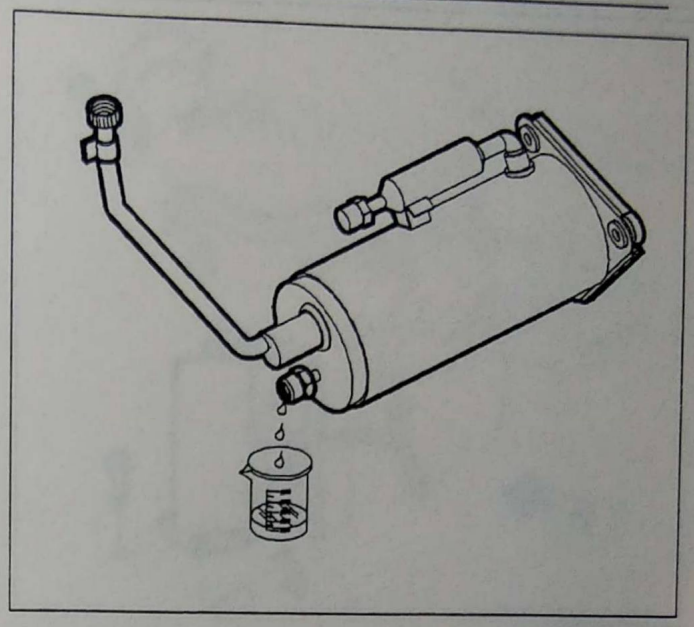
c0IVIPRESSOR OIL MEASUREMENT

. Tip compressor with the low side port facing upward then drain oil into a clean container from the high ' side port first. &

: Turn compressor over and drain oil from the low side.

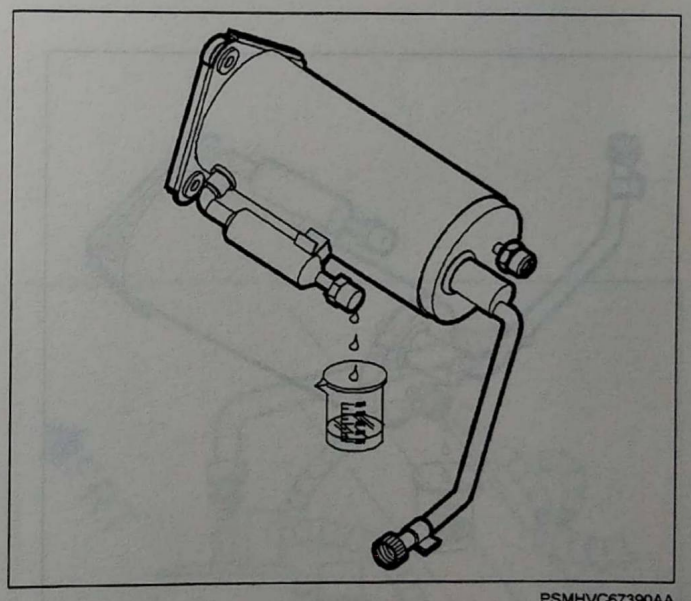
; Move the compressor to a different position to remove all the oil possible.

4. Turn the compressor back to the high side to redrain then back to low side and redrain. Stop oil draining ' when the oil coming from the high and low side ports become only drops. Measure oil removed and record .



PSMHVC67389AA

5. Discard removed oil as all replacement compressors come with 480 cc of new Electric Vehicle Ester compressor oil installed.



PSMHVC67390AA

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JUDGEMENT ON CONTAMINATION OF COMPRESSOR OIL

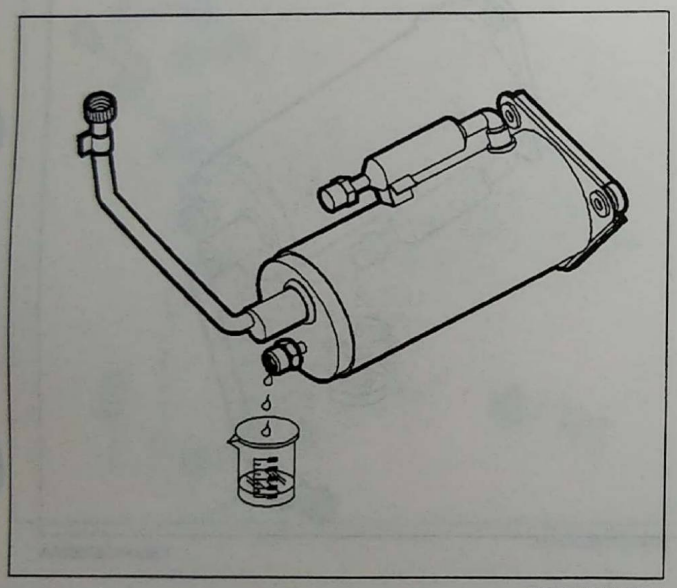
Unlike motor oil, no cleaning agent is added to the compressor oil. Even if the compressor is run for a long period of time the oil never breaks down as long as there is nothing wrong with the compressor or the heat pump system.

Inspect the extracted oil for any of the following conditions:

- Color change from clear to dark brown or black.
- Presence of foreign substances, metal filings, etc., in the oil.

When the oil extracted from the compressor is found as mentioned above, the accumulator must be replaced.

NOTICE: Failure to replace accumulator will result in damage to new compressor.



PSMHVC67389AA

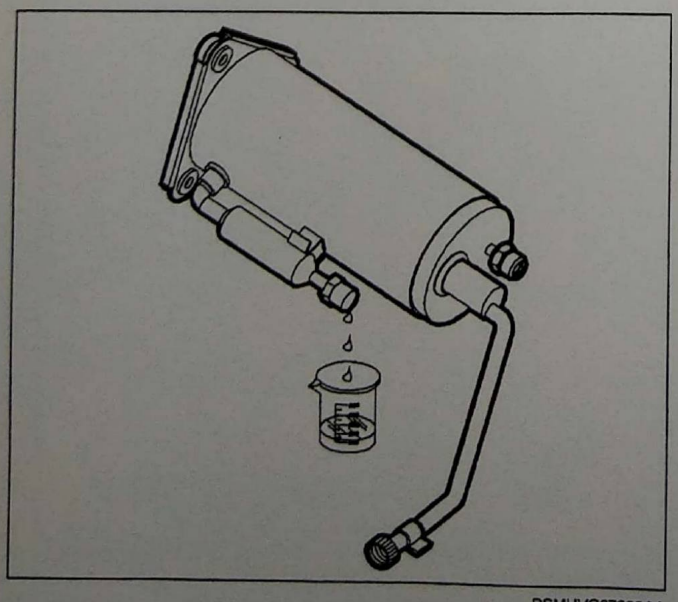
NEW COMPRESSOR INSTALLED OIL CHARGE

IMPORTANT: Service compressors are charged with 480 ml of Electric Vehicle Ester refrigerant oil.

1. With the compressor in the upright position, loosen high side cap slowly to release nitrogen (N2) charge from compressor. Remove high and low side caps.

IMPORTANT: Take care not to let the oil escape.

2. Install caps on removed compressor.



PSMHVC67390AA

3. Drain new compressor as described in compressor oil measurement. There will be more oil that can be drained from the new compressor that has been charged with 480 ml than the compressor that was removed.

IMPORTANT: Oil drained from the new compressor can be installed if drained into a clean container.

4. Add the recorded amount of oil drained from the removed compressor. Also add the amount of oil lost during recovery. Add oil to the low pressure side of the new compressor. This will keep the same amount of oil in the heat pump system.

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cONIPRESSOR

INSTALLATION

)RT4NT: Keep compressor level during Ration to avoid oil loss from thc low or hiSh side ports.

1. Position compressor on compressor mounting bracket. Make sure that the low side port is indexed to the rear of the car.
2. Install compressor band brackets onto insulators. Make sure that the band brackets are positioned in the center of the insulators.
3. Install compressor mounting bracket bolts and nuts.

Torque:

Tighten compressor mounting bracket bolt until the bolts don't move in the insolators. Do not over tighten these bolts this will cause excessive noise from the compressor if the isolators are crushed.

4. Position compressor band bracket on compressor body. Install compressor band bracket bolt.

Torque: 13 N*m (10 ft-lbs)

5. Install ground strap bolt to left mid-rail.

Torque: 10 N*m (89 in—lbs)

6. Remove O-ring from reversing valve tube fitting and install a new Electric Vehicle approved service replacement O-ring.

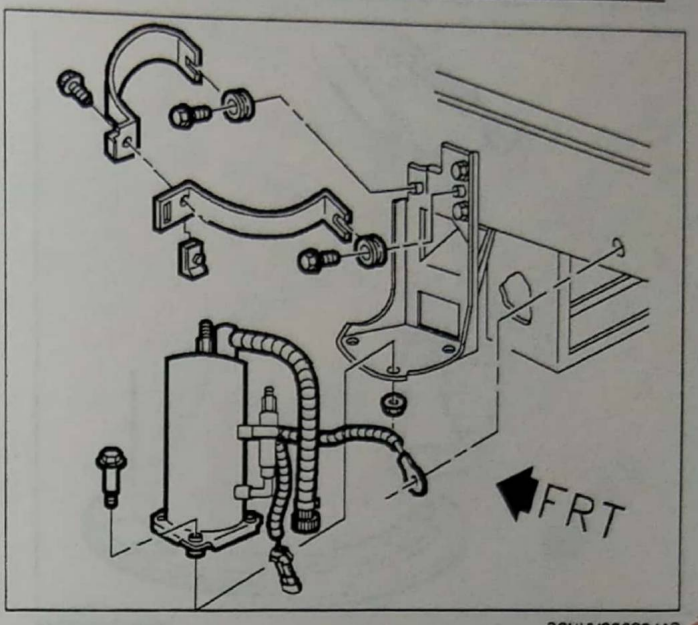
NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

7. Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a UTench to back up fittings could cause distortion of connections, tubes or components.

8. Connect reversing valve tube to heat pump compressor.

Torque: 20 N»m (15 ft-lbs)



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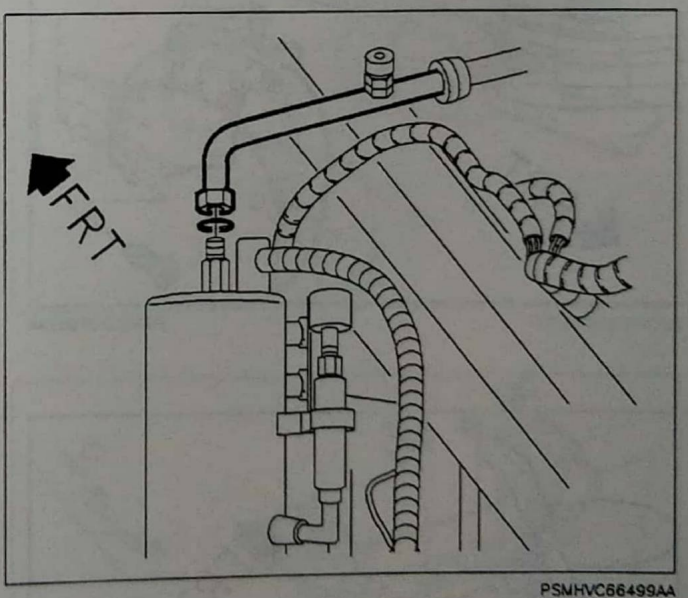

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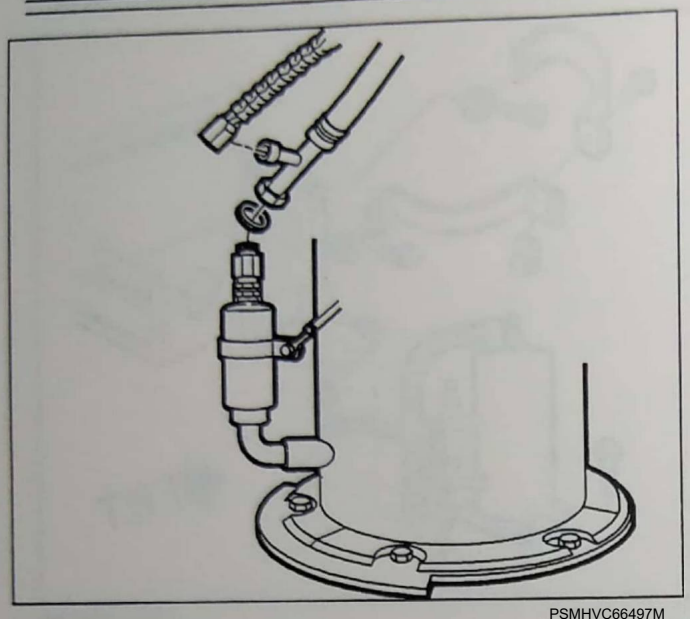


PSMHVC66497M

9 Remove O-ring from suction tube fitting and install a new Electric Vehicle approved service replacement O-ring.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R-134a (PAG) oil or R-134a heat pump (Ester) oil will cause premature corrosion of fitting joints.

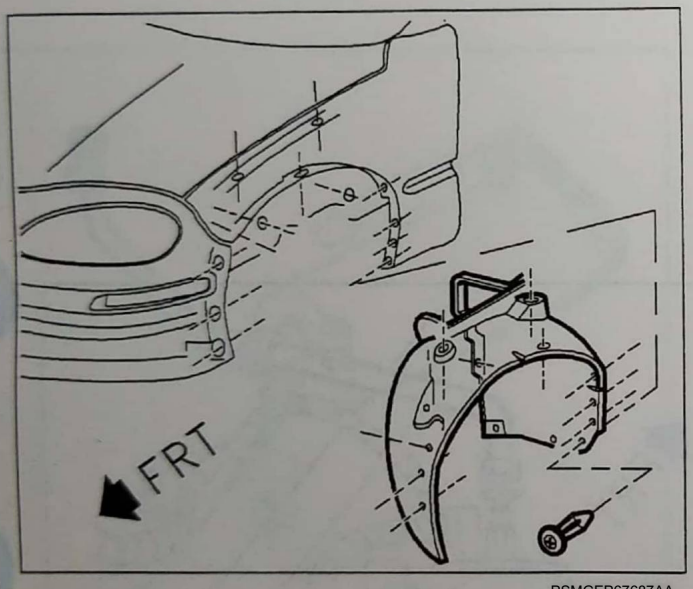
10. Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE- Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

11. Connect suction tube to heat pump compressor.

Torque: 20 N*m (15 ft—lbs)

12. Connect low pressure transducer electrical connector.



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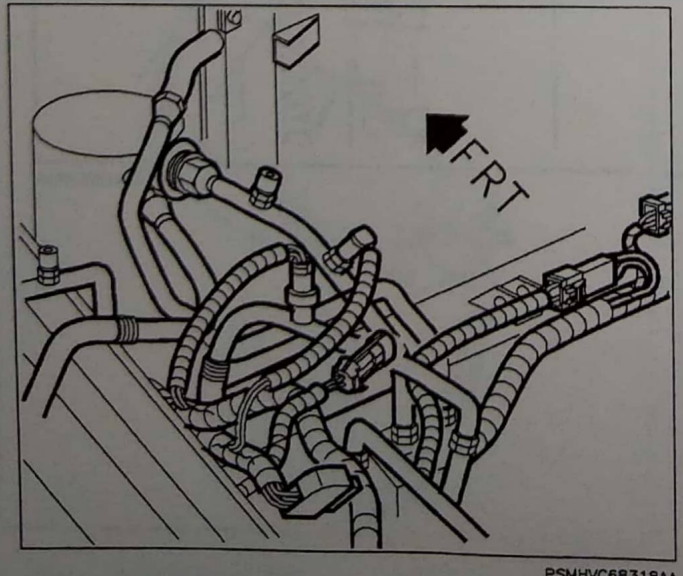
13. Install left front wheel house liner.

14. Lower vehicle on hoist.



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15. Connect ground sensing harness connector.

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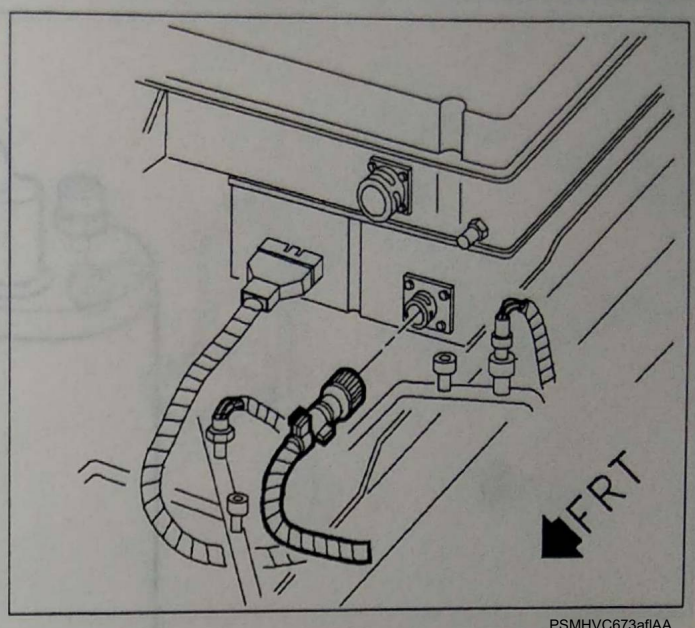
16. Connect compressor electrical cannon connector to plM-
Me hi£h voltage. (Refer to "High Voltage
)7. E^i$_e$" procedure in this service manual.)

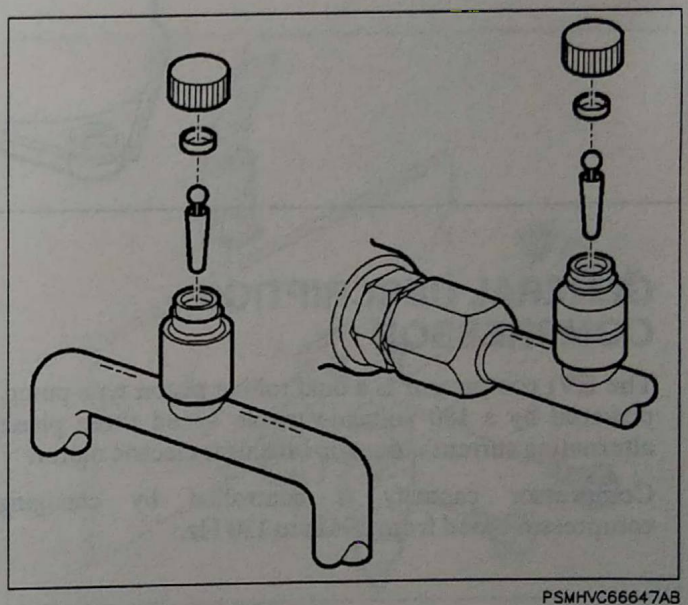


PSMHVC673aflAA

18. Install new Electric Vehicle approved service replacement heat pump schrader valves.

19. Evacuate, charge, and leak test heat pump system.

20. Verify heat pump system operation by performing system performance test.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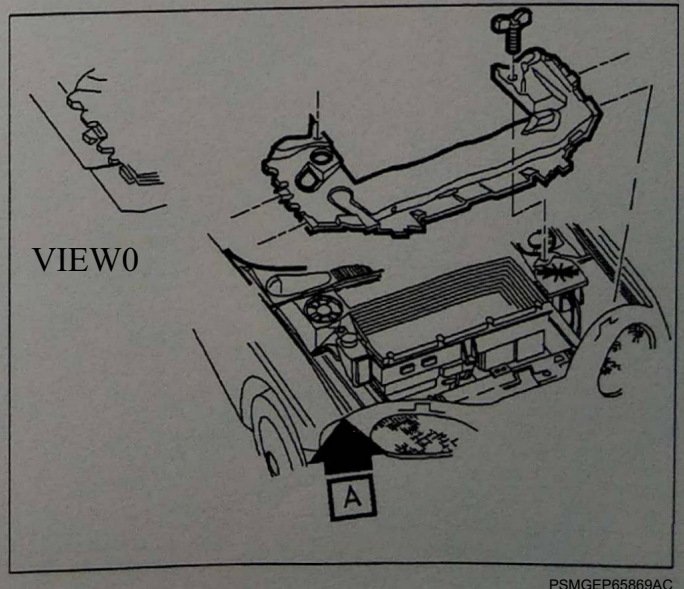
21. Install engine compartment sight shield.



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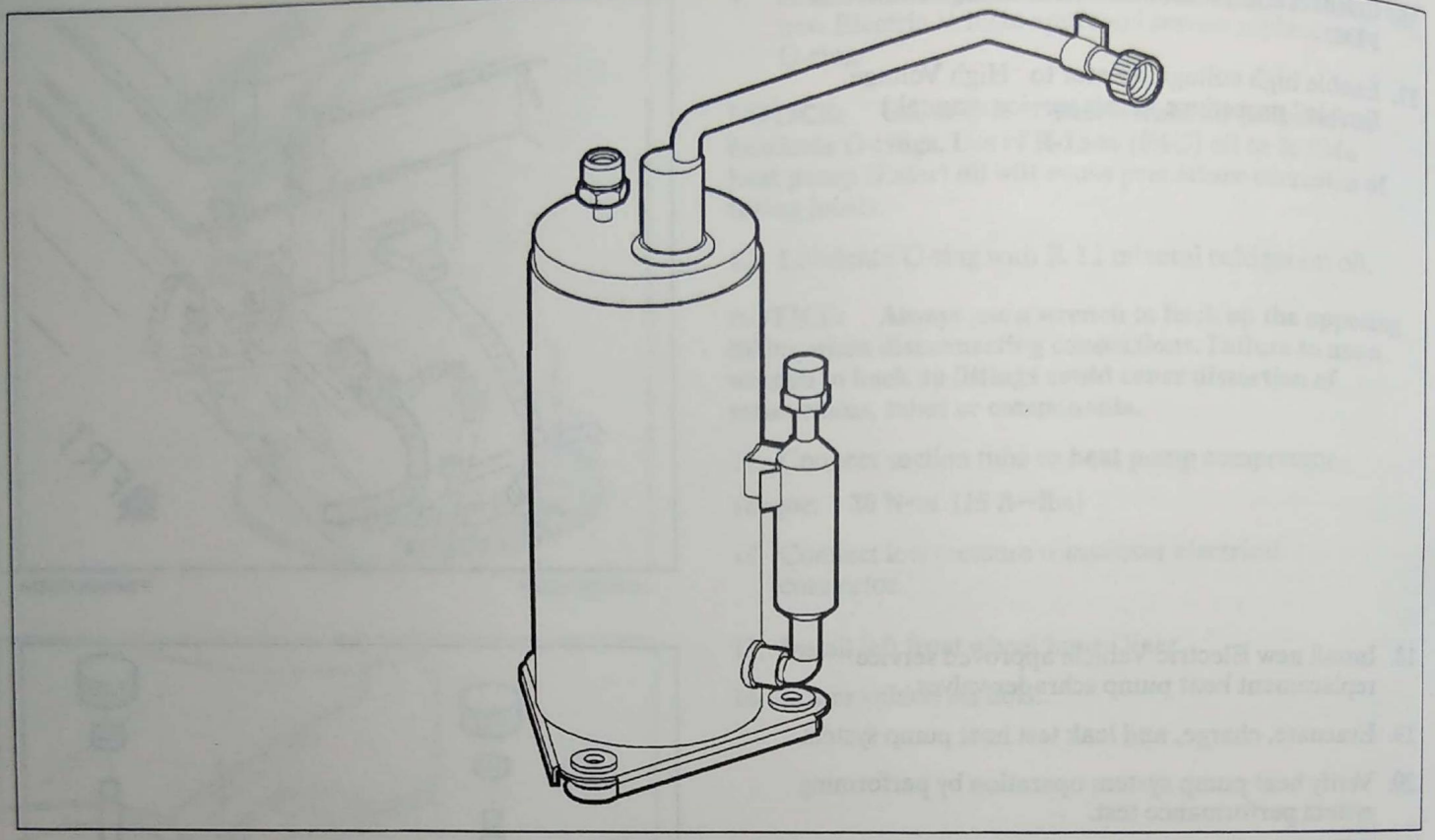

PSMHVC67397AA

L A GENERAL DESCRIPTION
7 COMPRESSOR

The EVi compressor is a dual rolling piston type pump, powered by a 180 voltage-variable speed three phase alternating current induction brushless electric motor.

Compressor capacity is controlled by changing compressor speed from 25 Hz to 120 Hz.

The compressor displacement is 19 cc per revolution.

The compressor's main function is compress the low pressure refrigerant vapor from the accumulator into a high pressure, high temperature vapor.

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COMPRESSOR MOUNTING BRACKET

REMOVAL

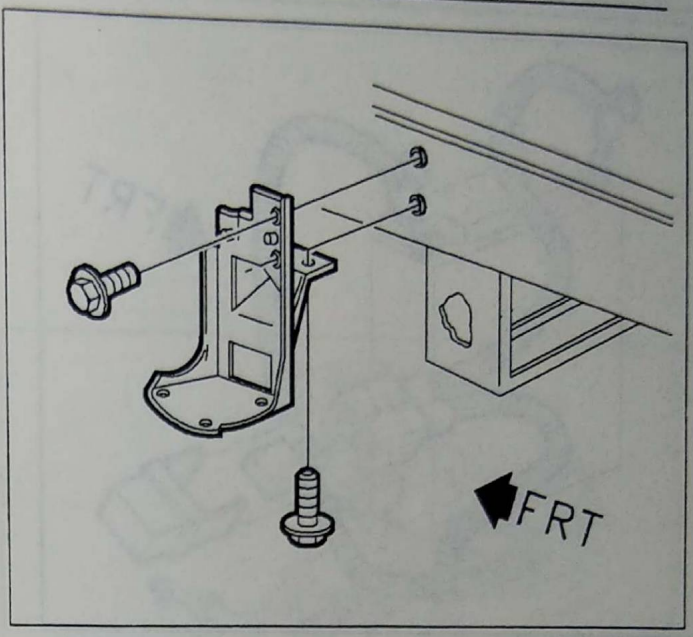
1. Remove A/C compressor. (Refer to "Compressor removal" procedure in this section.)
2. Remove fastener from compressor mounting bracket to mid-rail.

INSTALLATION

1. Position compressor mounting bracket to mid-rail aligning mid-rail insert nuts to bracket. Hand start fasteners into insert nuts. Tighten fasteners.

Torque: 33 N·m (24ft-lbs)

2. Install compressor. (Refer to "Compressor Installation" procedure in this section.)



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OUTSIDE AIR TEMPERATURE SENSOR ASSEMBLY

The outside air temperature sensor is located on the front end panel right side of radiator opening.

REMOVAL

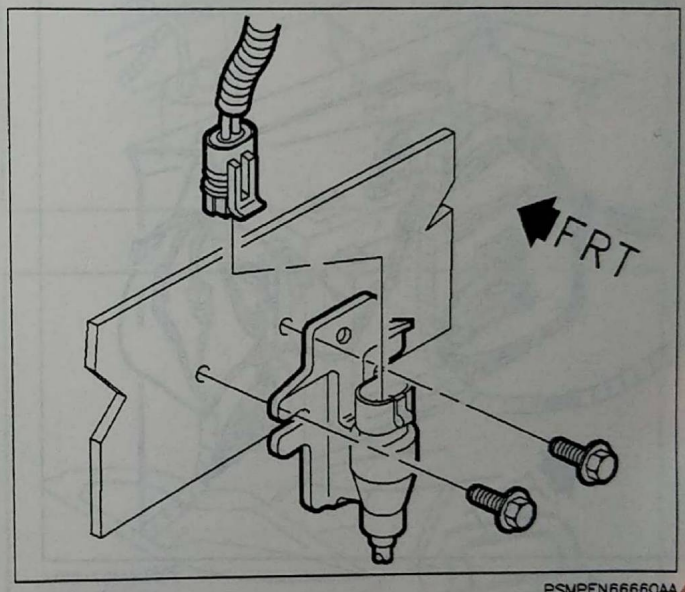
1. Disconnect outside air temperature sensor electrical connector.
2. Remove outside air temperature sensor screws.
3. Remove sensor from vehicle.

INSTALLATION

1. Position sensor to front end panel and install outside air temperature sensor screws.

Torque: 1.5 N-m (13 in-lbs)

2. Connect outside air temperature sensor electrical connector.



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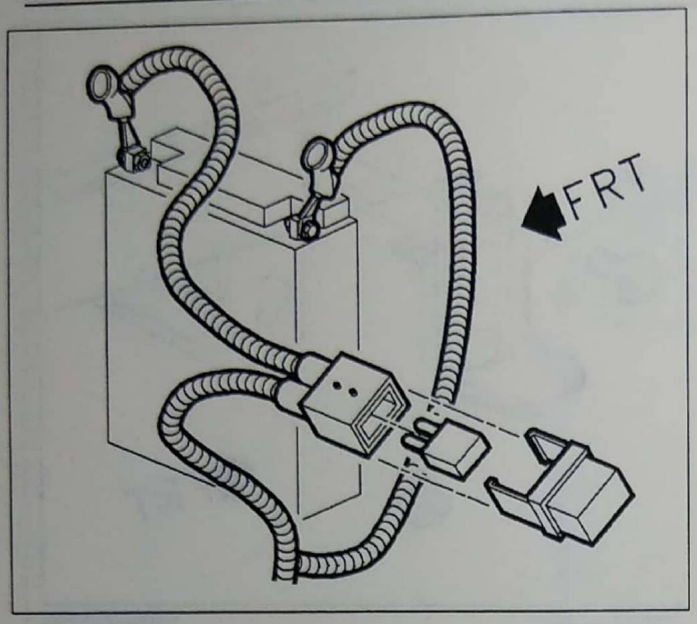


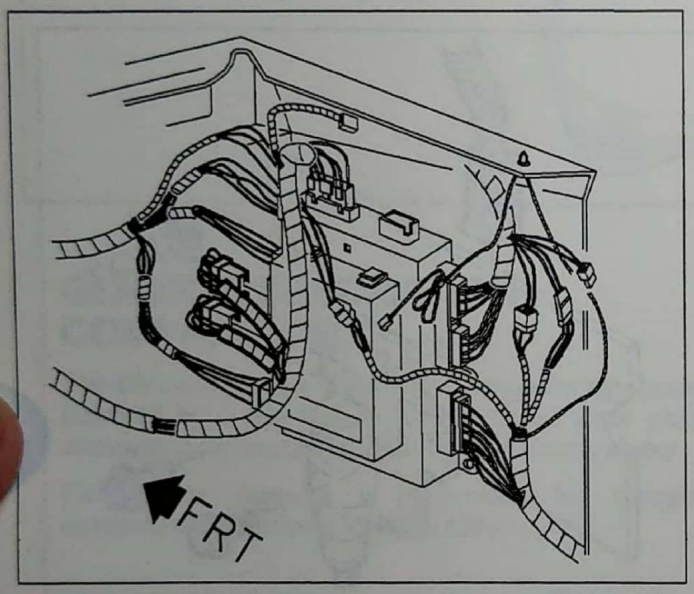
PSMGCH66678AA

HEAT PUMP VENTILATION SYSTEM/THERMAL CONTROL MODULE (HTCM)

REMOVAL

1. Place key pad in “LOCK” mode.
2. Remove the negative auxiliary battery cable 60 amp maxi fuse, located on the right hand mid-rail.

The heat pump ventilation system/thermal control module (HTCM) is attached to the right hand junction block (RHJB) with four retainers.



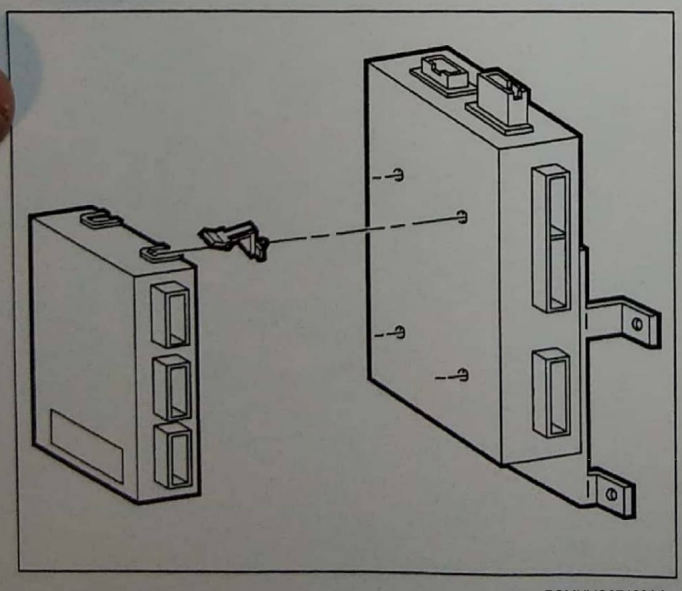
PSMHVC67422AA

NOTICE: Do not pull on connectors or wires to remove the HTCM. This could back out a terminal and cause an intermittent connection.

3. Release the four retainers securing the HTCM to RHJB and lift out.
4. Disconnect HTCM connectors.

INSTALLATION

1. Connect HTCM connectors.
2. Inspect HTCM retainers, replace retainers if bent or broken.



PSMHVC67423AA

3. Align retainers and push the HTCM into position on the RHJB.
4. Install 60 amp maxi fuse for the auxiliary battery cable.

IMPORTANT: The HTCM performs an initialization test when the battery voltage is restored. Do not activate the heat pump system for one minute after restoring power.

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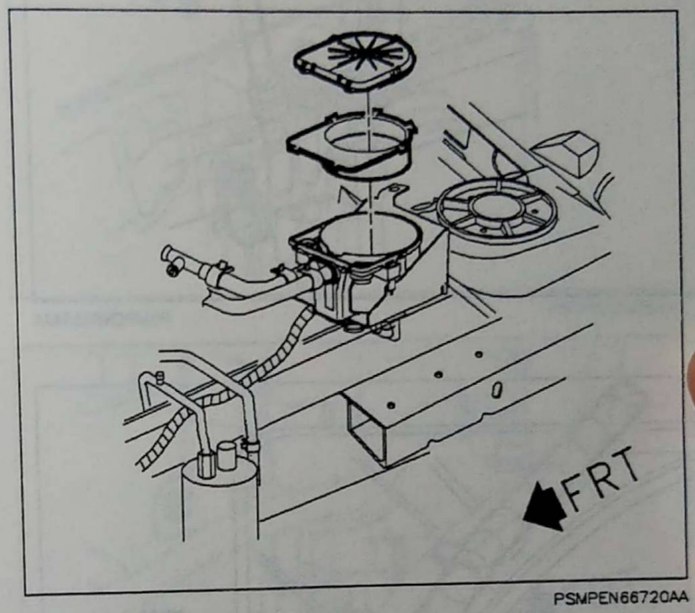
CONDENSER RADIATOR FAN MODULE ASSEMBLY (CRFM)

*REMOVAL

J Raise vehicle on hoist. (Refer to "Lifting and r > ■ Support Points" in this manual.) g nd Jack*ng

CAITION: TO REDUCE THE RISK OF SEVFRF SHOCKS AND BURNS, THE HIGH VOLTACF SYSTEM SHOULD BE DISABLED ANY Tim SERVICE WORK IS BEING PERFORMED (V AROUND THE HIGH VOLTAGE *SYSTEM* DOUBT, ALWAYS DIS ABLE THE HIGH vo^i SYSTEM. THE 12 VOLT SYSTEM WILL STIW R ACTIVE AFTER THE BEEN DISABLED. H,GH VTML &BLS

2. Disable high voltage. (Refer to "High Voltage Disable" procedure in this manual.)
3. Remove expansion tank cover.



PSMPEN66720AA

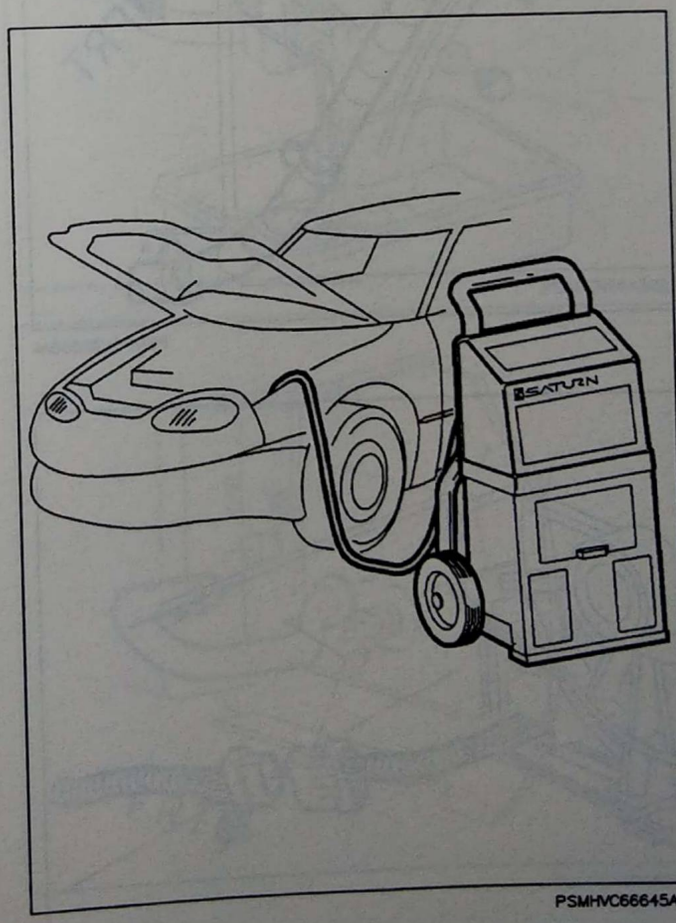
4. Recover R134-a refrigerant using an approved refrigerant recovery system.

   Follow the manufacturers operating instruction for system being used.

NOTICE: The air conditioning ref"ge ra?J a^l istU re rending station must meet UL standar s d tc- and contamination removal. Recovery syst m which cannot meet these standards are not approv ed for warranty repairs. Reuse of moisture or particulate contaminated refrigerant will result in prema ture compressor and other component failure.

Always check heat pump system for PJess^^^ th a manifold gauge set to determine if re^rlg® n present in the system. Performing recovery as a on a heat pump system which is open to atmosp here result of a leak, would allow the recovery station to pull only air into the tank.

NOTICE: Failure to check for residual oil from the Previous recovery can result in adding extra oil to the ^ehicle currently being serviced. This will also result i n Sufficient oil in the system previously work o n and could possible contribute to premature compres sor failure.



PSMHVC66645AA

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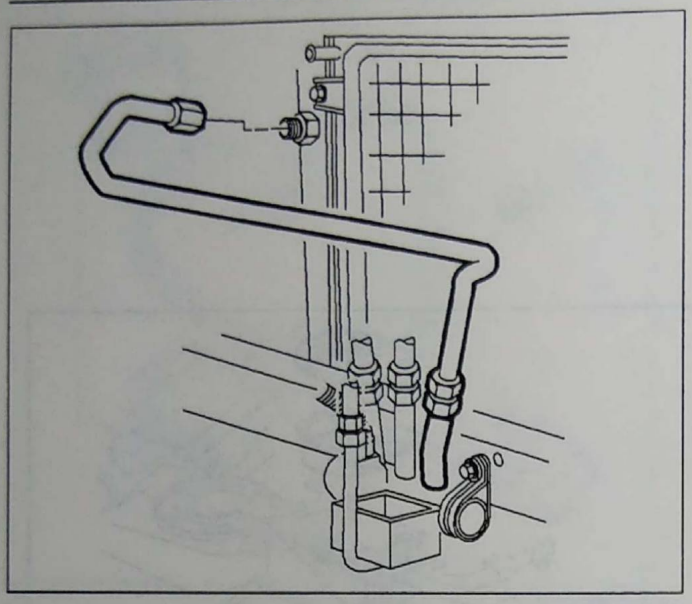
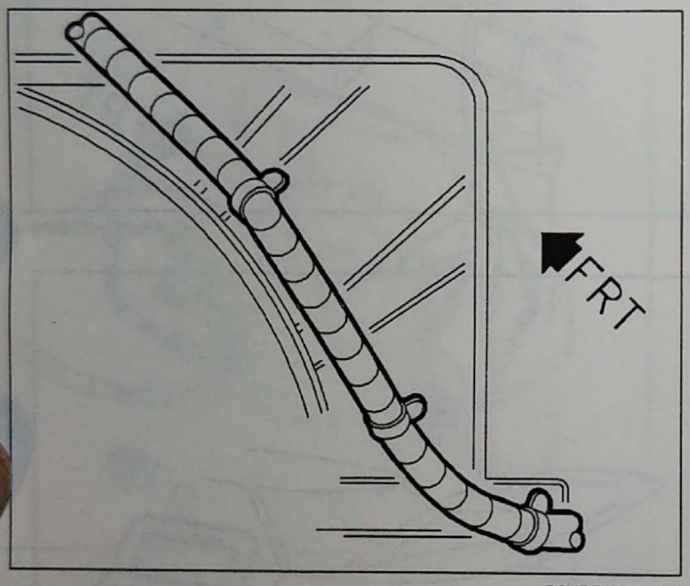


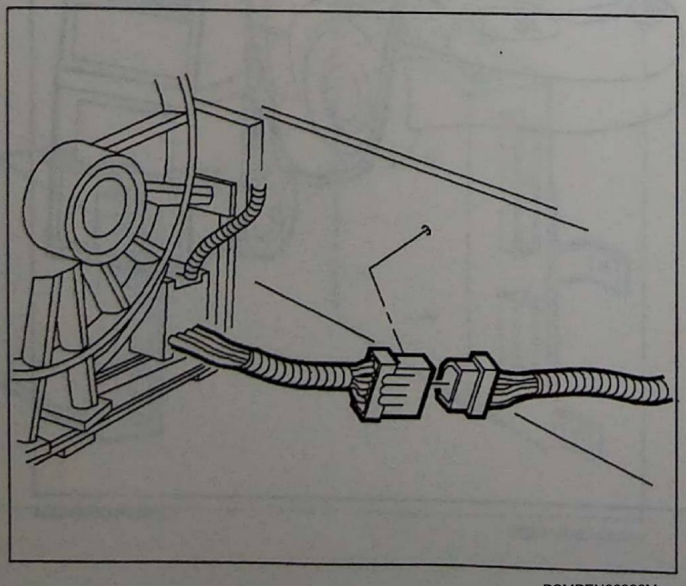
PSMPEN66554AA

5. Disconnect condenser tube from upper condenser fitting.



PSMPEN66656AA

6. Disconnect the charger receptacle cable rose bud retainers from fan shroud.



PSMPEN66396M

7. Disconnect fan motor buffer electrical connector at right hand mid-rail.

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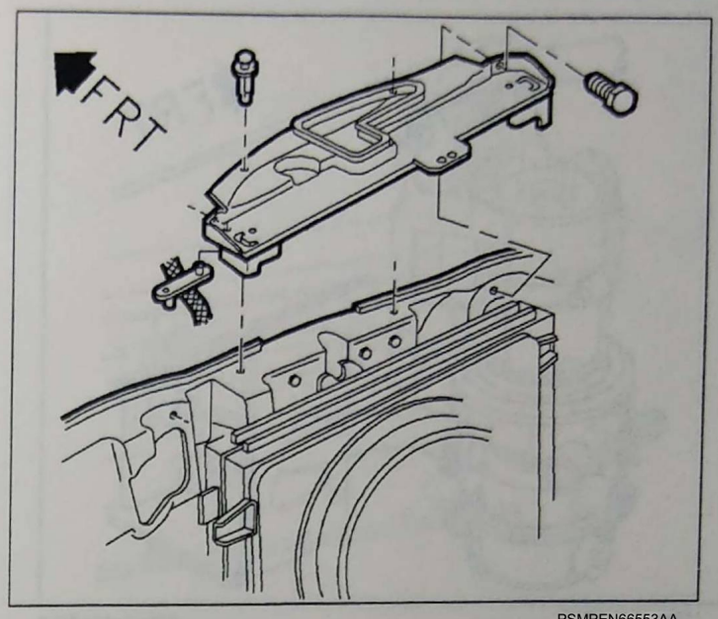
Remove *fasteners from the CRFM up*$_{per}$ mou ti
close out panel. Disconnect charger receptacle "c"? v n
ft. *hose retamer from close out panel. Position* $_{panel}$
ever *right side strut tower area.* *panel*

Raise vehicle on hoist.

9. *Remove underbody front air deflector* assem ly.
10 *(Refer to "Underbody Front Air* Deflector [6]
Assembly" in this manual.) *Or*



PSMPEN66553AA

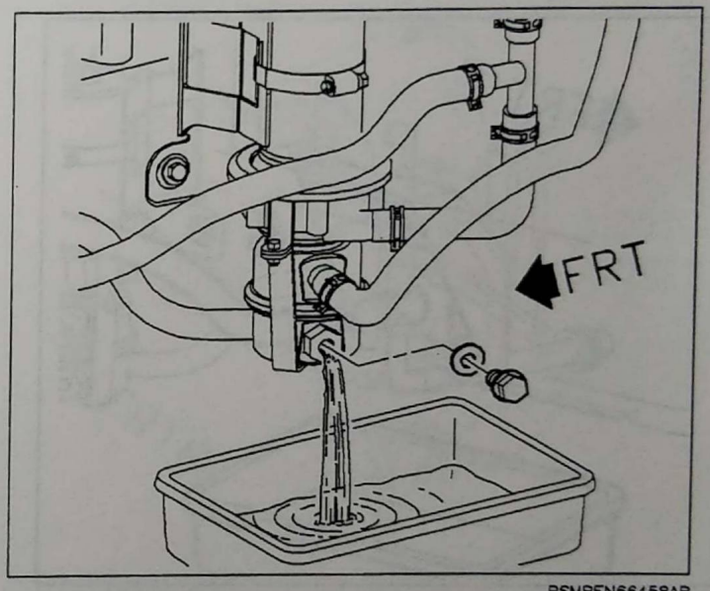
11. Position drain pan under coolant pump manifold.

IMPORTANT: A two gallon container will be required to hold the coolant.

a. Remove the drain plug and gasket from the coolant pump manifold allowing the coolant to flow from the main path, into container.

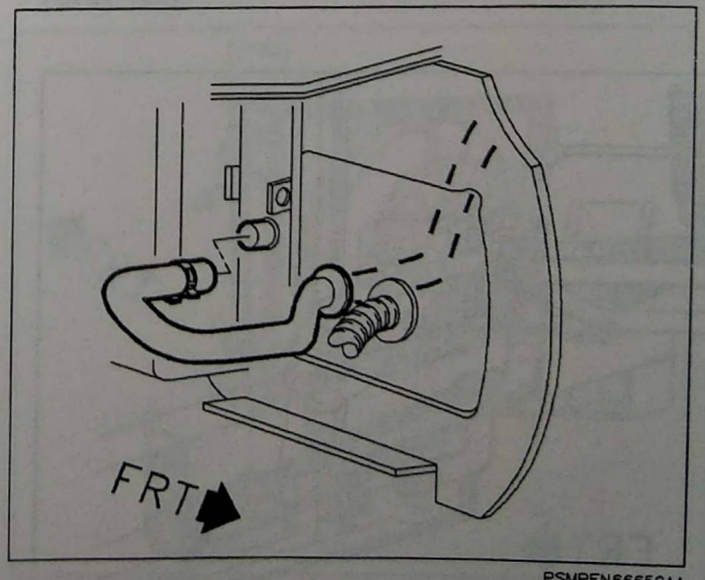
b. After coolant has drained from the main path reinstall water pump manifold drain plug and gasket.

Torque: 11 N»m (97 in-lbs)



PSMPEN66458AB

12. Remove charger receptacle outlet hose from the radiator.



PSMPEN66652AA

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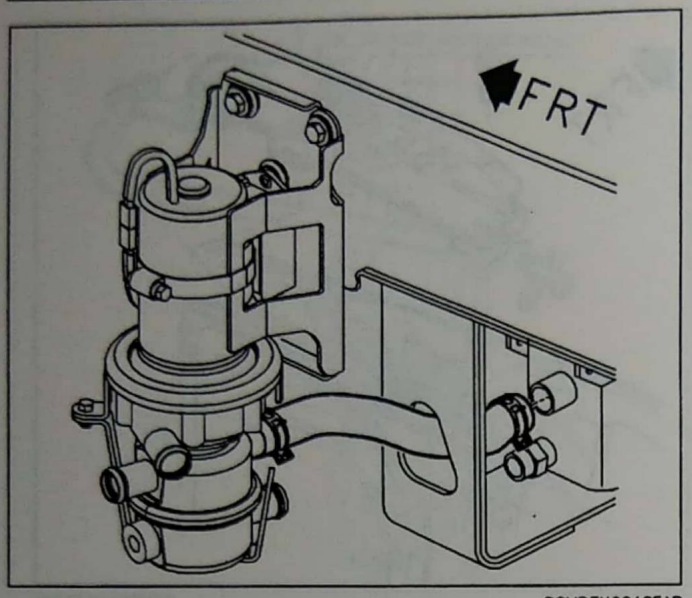
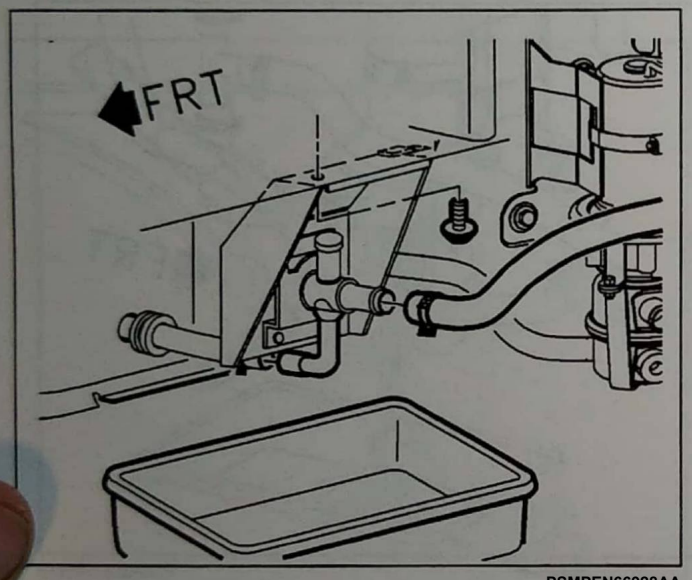


PSMPEN66465AB

13. Remove radiator outlet hose from radiator.

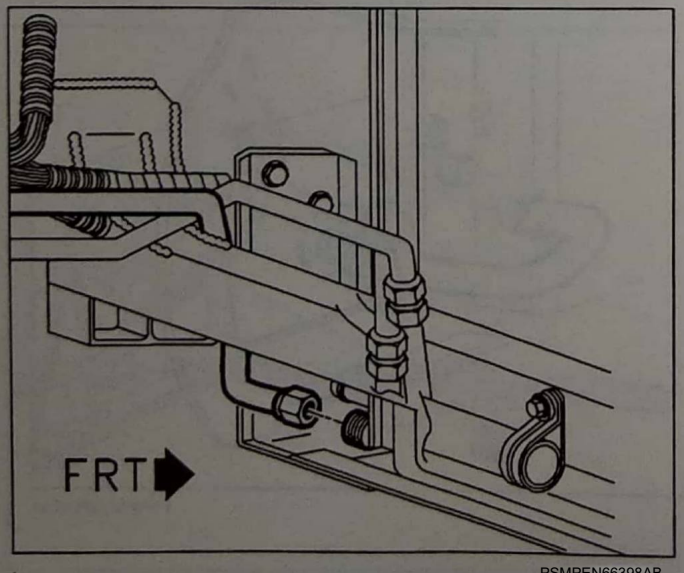


PSMPEN66928AA

14. Remove the charger receptacle inlet hose from charger receptacle coolant valve.

IMPORTANT: Coolant will flow from both the hose and the valve fitting.

15. Remove fastener retaining charger receptacle coolant valve, and position valve out of way.



PSMPEN66398AB

16. Disconnect the evaporator tube from condenser.
17. Lower vehicle on hoist.

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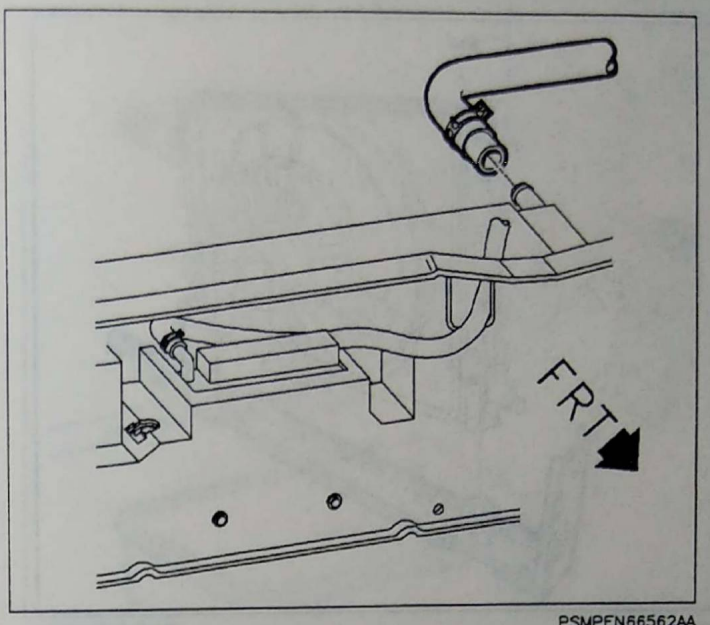
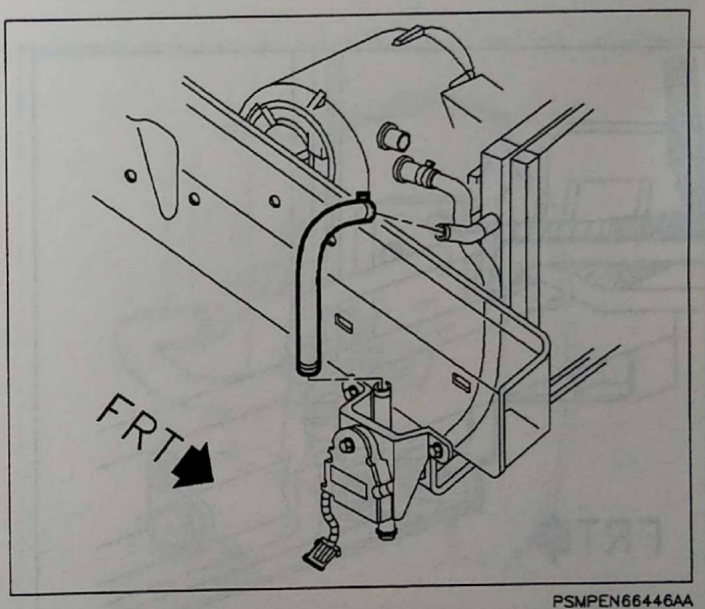
18. Remove vent hose from radiator.



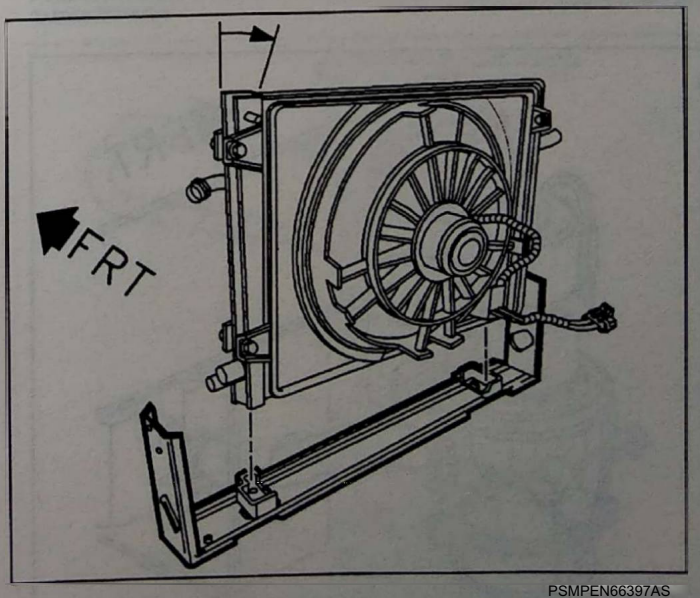
PSMPEN66562AA

19. Remove radiator inlet hose from radiator.



PSMPEN66446AA

20. Tilt the top of the condensor, radiator fan module (CRFM) assembly rearward and lift out of CRFM lower mounting support.



PSMPEN66397AS

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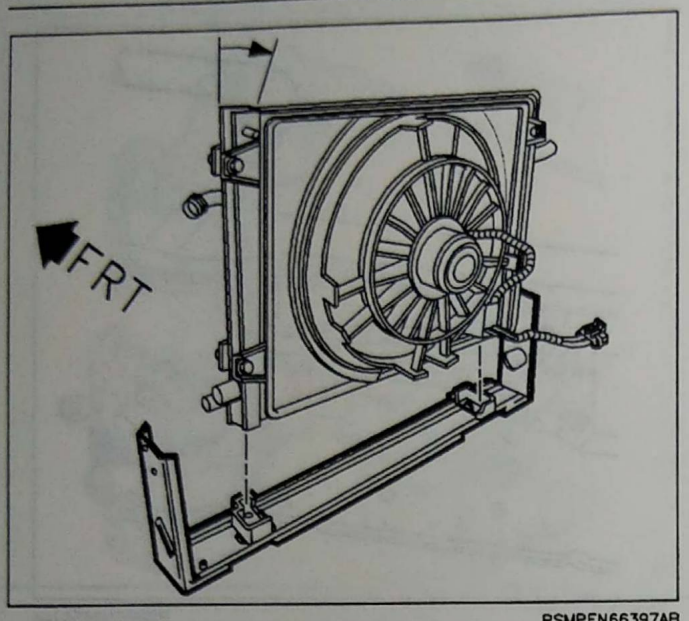
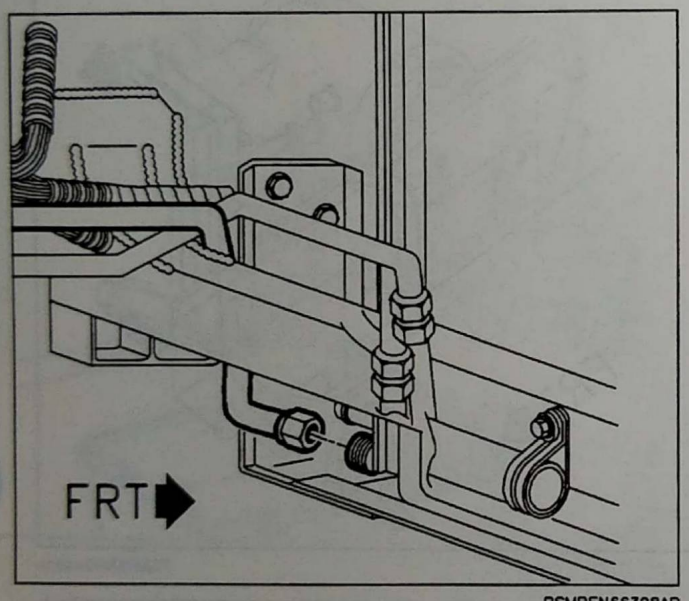


PSMPEN66397AB

INSTALLATION

1. Tilt the top of the CRFM assembly rearward, align radiator and condenser to CRFM lower mounting support insulators.
2. Raise vehicle on hoist.

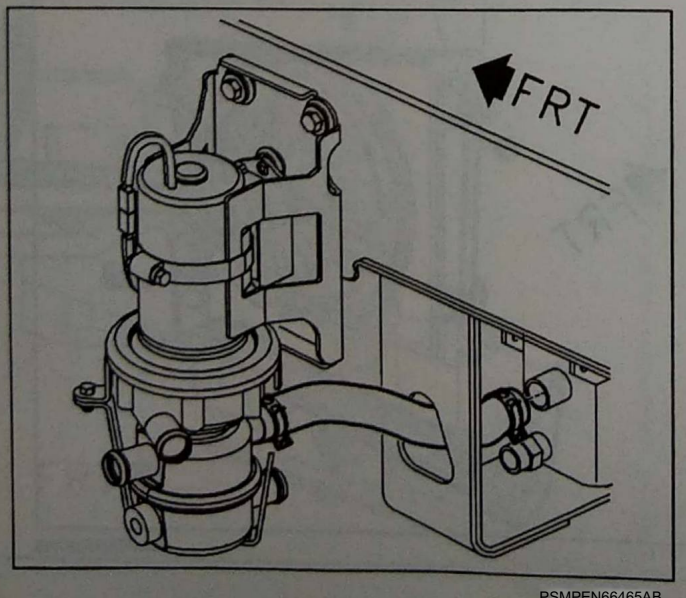


PSMPEN66398AB

NOTICE: Use only R-12 refrigerant oil (mineral) to lubricate O-rings. Use of R—134a (PAG) oil will cause premature corrosion of fitting joints.

3. Lubricate with R-12 mineral oil and install new O-ring on lower A/C condensor tube.
4. Install lower A/C tube line connection to condensor.

Torque: 20 Nᵉm (15 ft—lbs)



PSMPEN66465AB

5. Install radiator outlet hose to radiator. Position clamp tangs to 4 o'clock.

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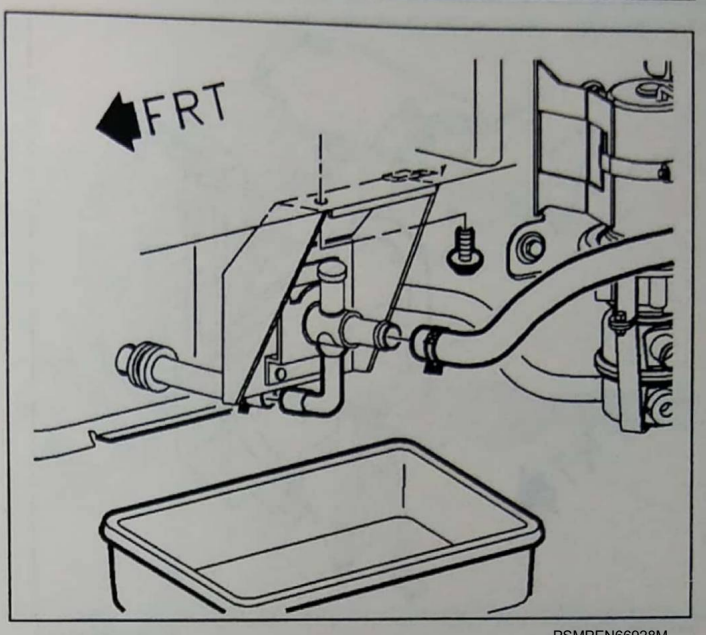
^a|l the charger receptacle coolant valve.

6 "e. ioN«m(89in-lbs)

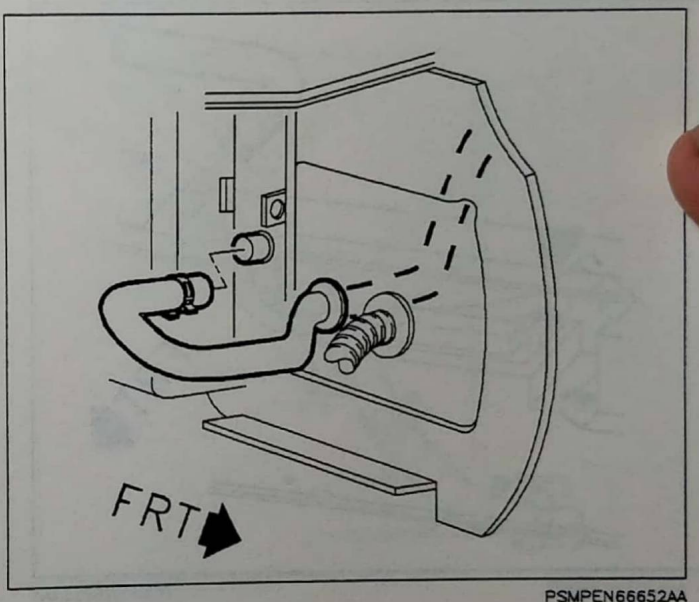
Torl,llC ■harger receptacle inlet hose to charger lnS,a iacle coolant valve. Position clamp tangs to 6 recep^ia o'clock-



PSMPEN66928M

8. Install charger receptacle outlet hose to the radiator. Position clamp tangs to 4 o'clock.

9. Lower vehicle on hoist.



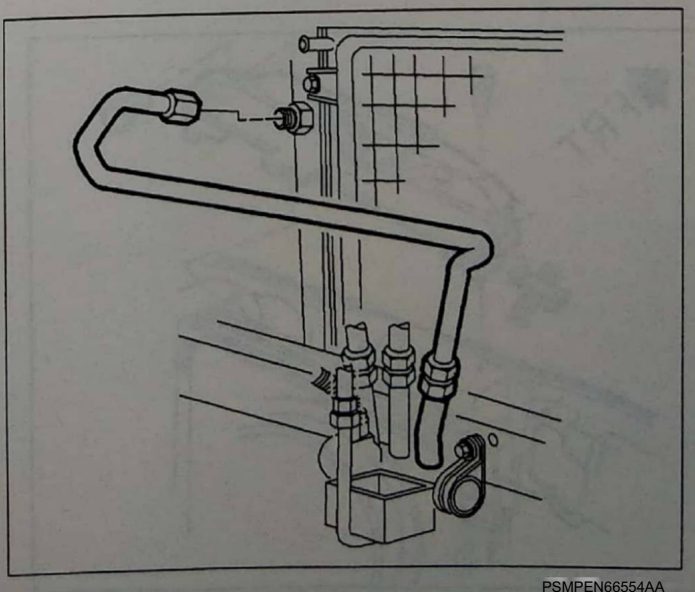
PSMPEN66652AA

J*OTICE: Use only R—12 refrigerant oil (mineral) to ^ricate O-rings. Use of R-134a (PAG) oil will cause Immature corrosion of fitting joints.

10. Rubricate with R —12 mineral oil and install new -ring on upper A/C condensor tube.

11. Install upper A/C tube line connection to condensor.

Torque: 20 N.m (15 ft-lbs)



PSMPEN66554AA

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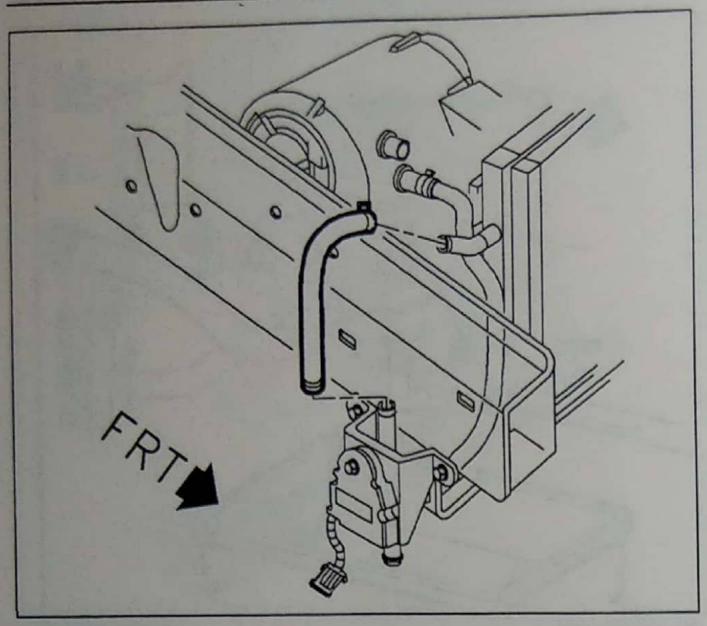
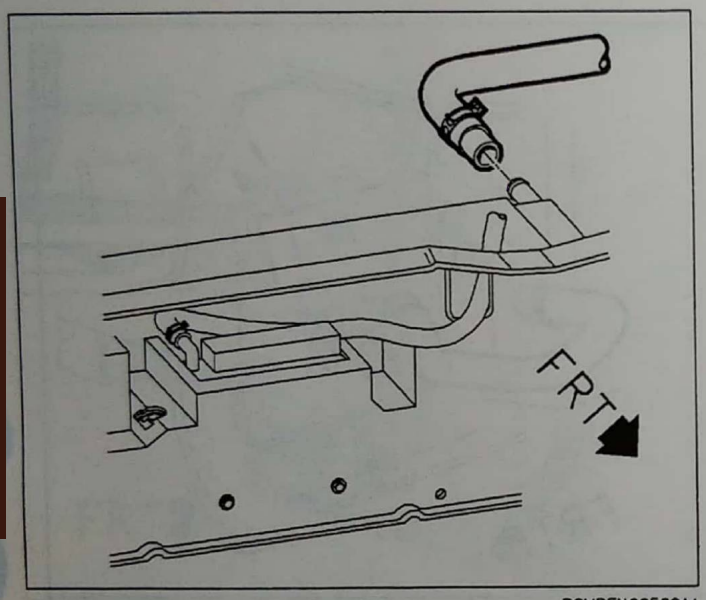


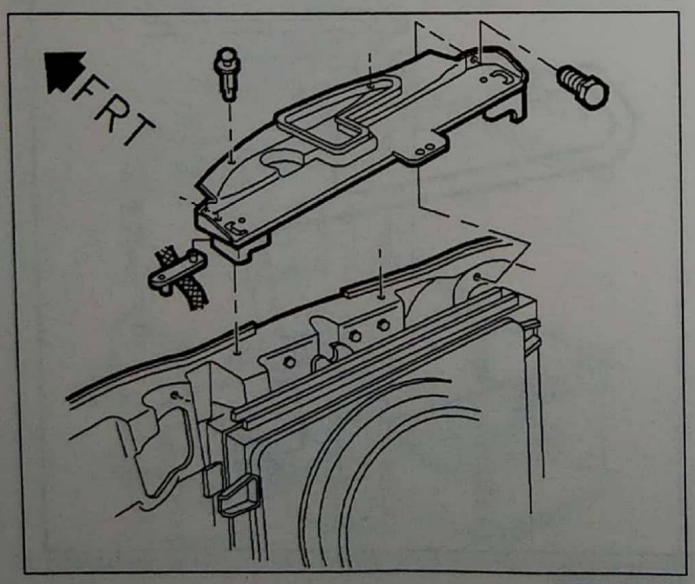
PSMPEN66446AA

12. Install radiator inlet hose to radiator. Position damn tangs to 12 o'clock.



PSMPEN66562AA

13. Install radiator vent hose to radiator. Position clamp tangs to 12 o'clock.



PSMPEN66553AA

14. Connect charger receptacle vent hose retainer to radiator upper mounting close out panel.
15. Install radiator upper mounting close out panel.

Torque: 10 N^{e}m (89 in-lbs)

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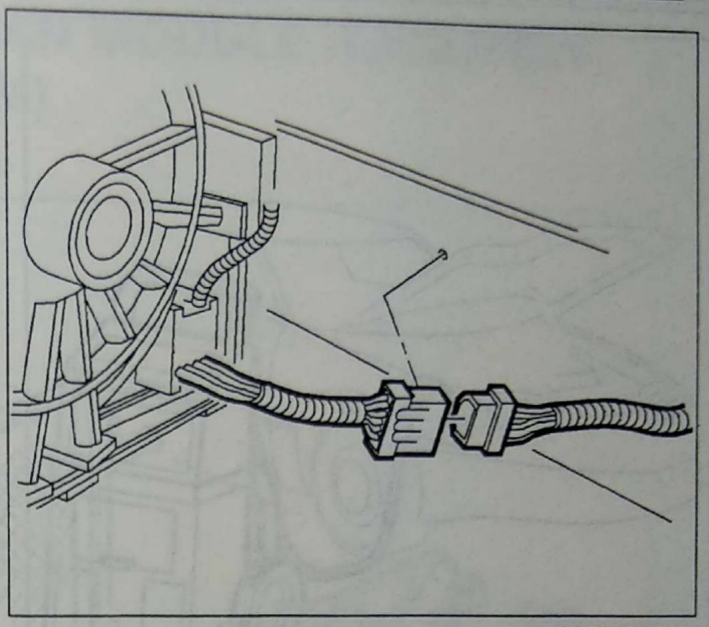
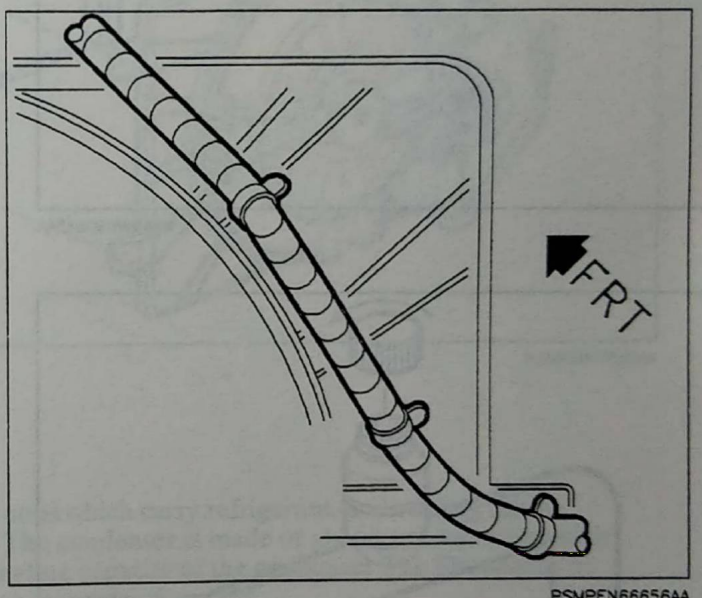
16. Connect fan motor buffer electrical connector at right hand mid-rail.



PSMPEN66396AA

17. Connect charger receptacle cable rose bud retainers to fan shroud.

18. Enable high voltage. (Refer to "Enable High Voltage" procedure in this manual.)



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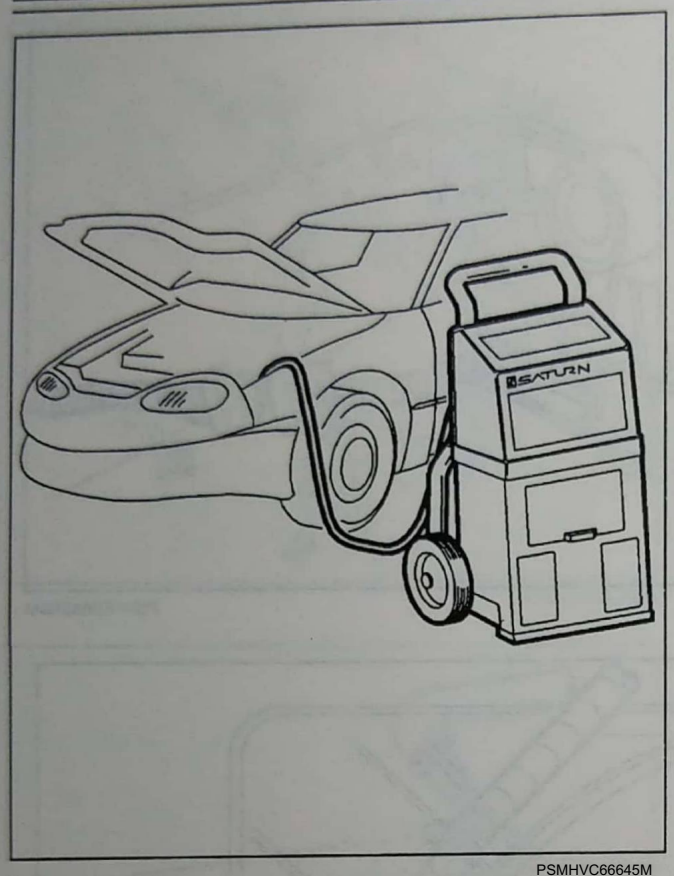


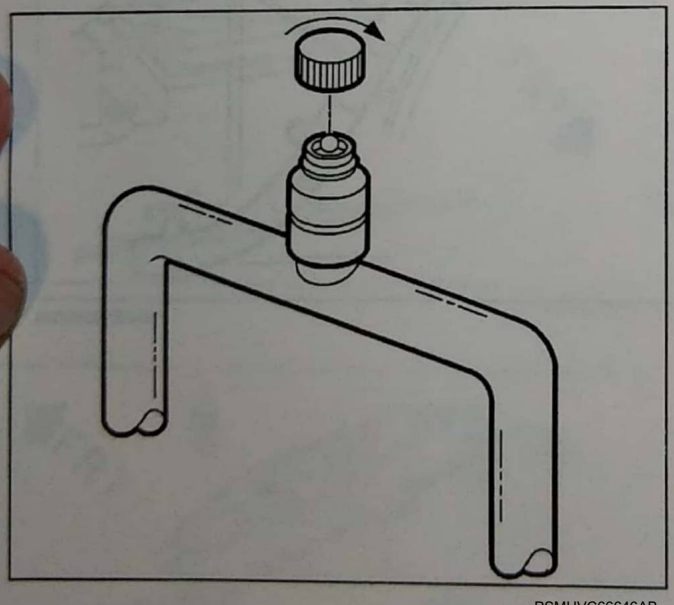
PSMHVC66645M

19. Evacuate heat pump system. Install new Electric Vehicle approved service replacement heat pump schrader valves prior to evacuating system. Even though a schrader valve may look the same, it is extremely important that only recommended service replacement heat pump schrader valves be used or leakage of refrigerant will occur.

20. The refrigerant system must be evacuated using an air conditioning refrigerant recovery and recycling system. Follow the manufacturers operating instruction for system being used.

22 Allow system to evacuate for the predetermined time on the refrigerant recovery and recycling system. Note vacuum gauge readings.

22 Watch low side gauge for vacuum loss (one to three ' minutes). If loss is less than 3.38 kPa (1 in. Hg) from level recorded in Step 21, proceed to charging the heat pump system.



PSMHVC66646AB

23. If vacuum loss is greater than 3.38 kPa (1 in. Hg) from level recorded in Step 21, charge with 0.23 kg (1/2 lb.) R-134a. Leak test, repair leaks and re-test.

24. The refrigerant system must be charged using a R134a air conditioning refrigerant charging system. Follow the manufacturers operating instructions for system being used with the following exceptions.

25. Do not connect low pressure valve on the charging station closed at all times.

26. Perform the entire charge procedure through the high-pressure service fitting on the discharge pipe.

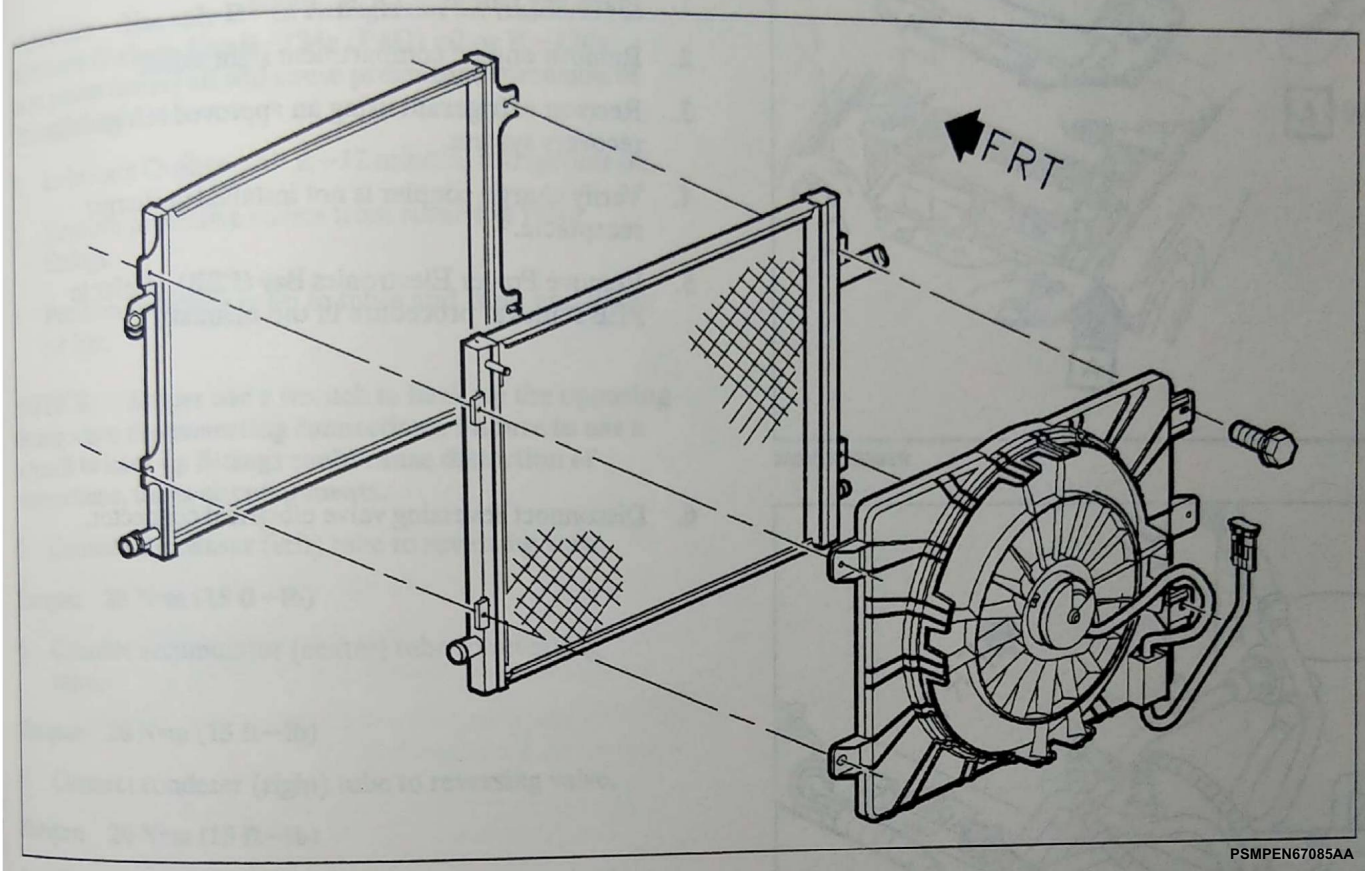
27. Charge the heat pump system with 0.91 kg (2.0 lbs.) of R134a refrigerant.

IMPORTANT: Make sure there is an O-ring seal inside of caps before installation because the cap is the primary seal for heat pump system service fittings. Failure to tighten cap will result in refrigerant leakage.

28. Fill coolant system as outlined in "Fill Coolant System" procedure found in this section.

29. Install underbody front air deflector assembly. (Refer to "Underbody Front Air Deflector Assembly" in this service manual.)

^nFMSER, RADIATOR, FAN MODULE ASSEMBLY C0ND (CRFM)



PSMPEN67085AA

GENERAL DESCRIPTION

ne Mdtnser assembly in frontof me radiator is made up of coils which carry refrigerant and cooling fins to provide rapid transfer of heat during heating and A/C modes. The condenser is made of aluminum tubes on which «e mounted aluminum fins. The fins P[ov de ' he coo ling or heating capacity : of the condenser.The fins should be kept clean and less than 20 percent of the tin c hO uld be bent or otherwise damaged. s

Tne radiator is a cross-flow type with the tanks locate d on the right and of t left he core.

J«™ lanl fan k 10 mm (5 in) long with seventunequaUy spaced b a des to provide air flow through the electric fan

ra<hator/condenser. The fan is driven by an dec tric motor which is attache to the radiator shroud. The

®otOr is controlled by the HTCM based on coolan TMP and increase motor • pera ture and A/C r q e uest. The voltage to the electric fan

motor is pulse width modulated to reduce current g an sur e life

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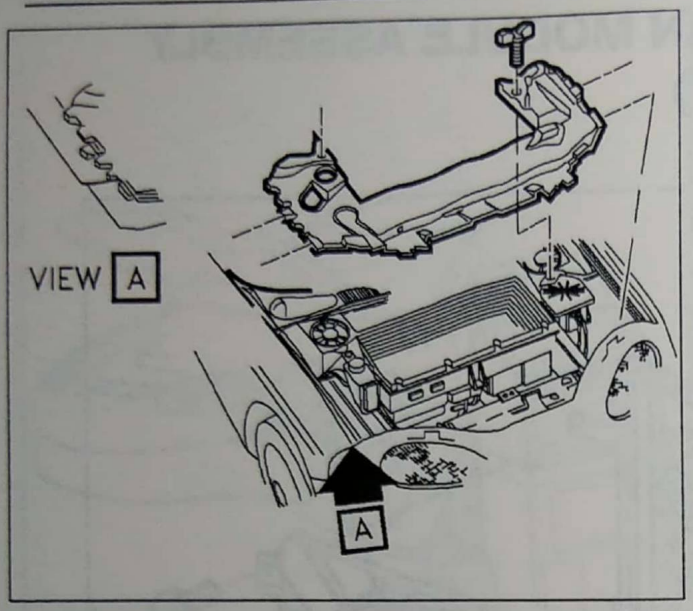
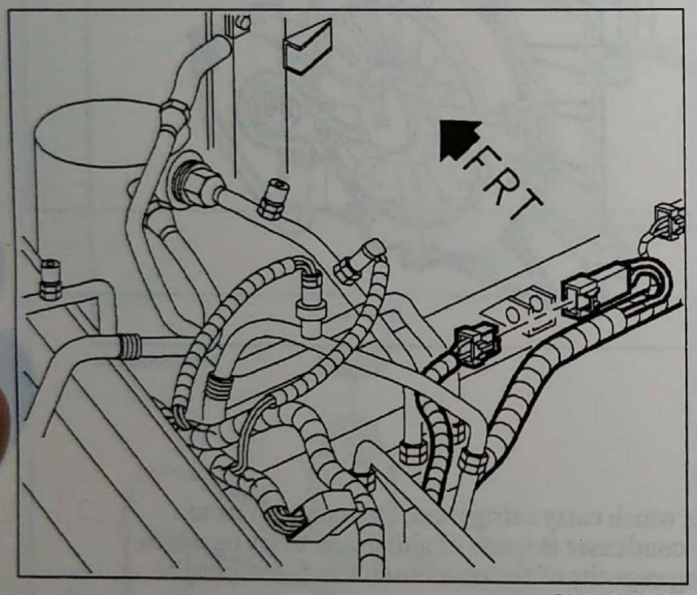


PSMGEP65869AC

HEATER AND A/C REFRIGERANT REVERSING VALVE ASSEMBLY

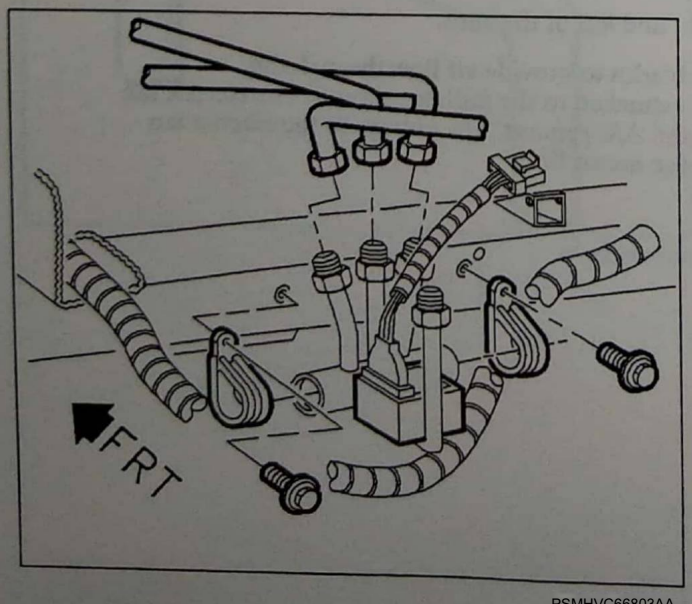
REMOVAL

1. Place key pad in “LOCK” mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.
4. Verify charge coupler is not installed in charger receptacle.
5. Remove Power Electronics Bay (PEB). (Refer to PEB removal procedure in this manual.)



PSMHVC66495AA

6. Disconnect reversing valve electrical connector.



PSMHVC66803AA

7. Remove reversing valve retainers from front lower tie bar.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

8. Disconnect condenser (right) tube from reversing valve.
9. Disconnect accumulator (center) tube from reversing valve.
10. Disconnect condenser (left) tube from reversing valve.
11. Disconnect reversing valve (rear) tube from reversing valve.
12. Remove reversing valve from vehicle.

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>^ON

1. O-rings from all four tube fittings that connect to reversing valve and install new Electric Vehicle approved service replacement O-rings.

- Use only R-12 Refrigerant oil (mineral) to - O-rings. Use R-134a (PAG) oil or R-134a '''Vpiin'P (csler^ oil wil1 cause premature corrosion of fitting joints-

2. Lubricate O-rings with R-12 mineral refrigerant oil.

3. Remove protective covers from reversing valve fittings.

4. Position reversing valve to tubes and front end lower tie bar.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a mnch to back up fittings could cause distortion of connections, tubes or components.

5. Connect condenser (left) tube to reversing valve.

Torque: 20 Nem (15 ft—lb)

6 Connect accumulator (center) tube to reversing valve.

Torque: 20 N*m (15 ft—lb)

7. Connect condeser (right) tube to reversing valve.

Torque: 20 N*m (15 ft-lb)

8. Connect reversing valve (rear) tube to reversing fittings.

Torque: 20 N»m (15 ft-lb)

5- Install reversing valve retainers to front lower tie bar.

Torque: 10 N.m (89—lb)

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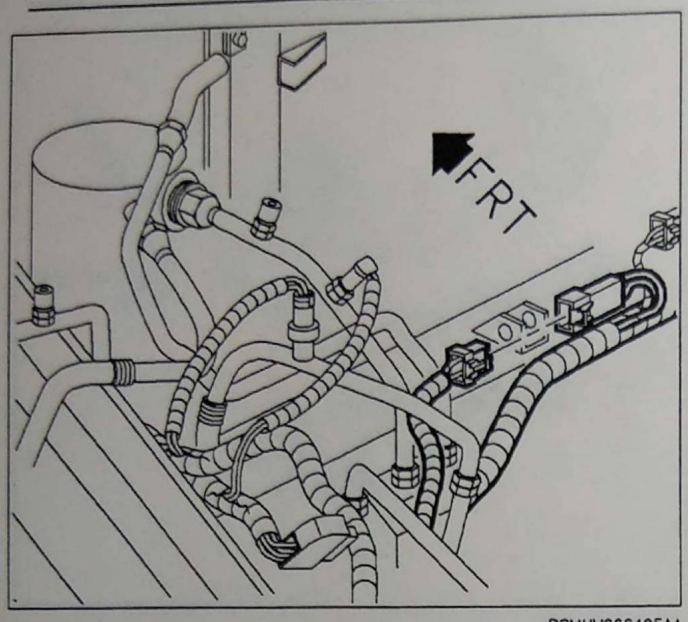
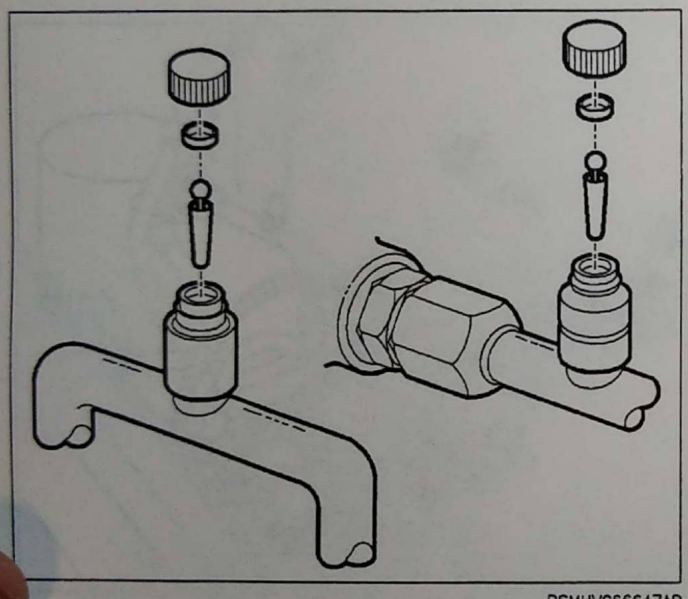


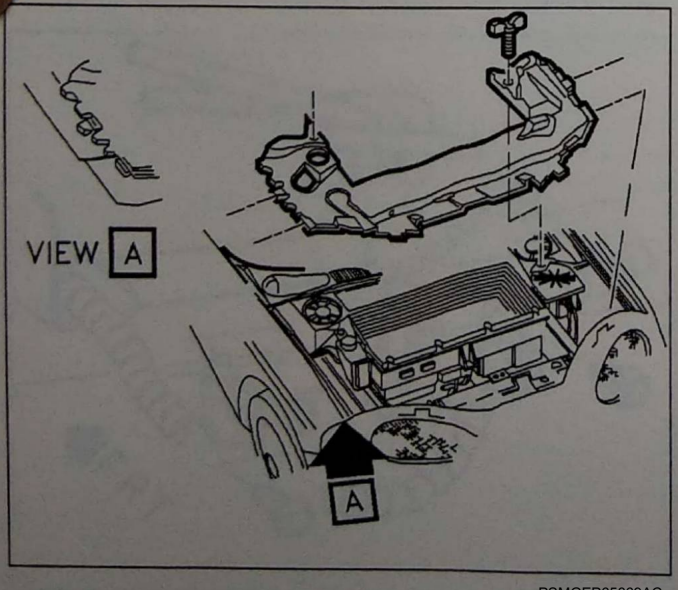
PSMHVC66495AA

10. Connect reversing valve electrical connector.



PSMHVC66647AB

11. Install new Electric Vehicle approved service replacement heat pump schrader valves.
12. Evacuate, charge, and leak test heat pump system.
13. Install Power Electronics Bay (PEB). (Refer to PEB installation procedure in this manual.)
14. Verify heat pump system operation by performing system performance test.



PSMGEP65869AC

15. Install engine compartment sight shield.

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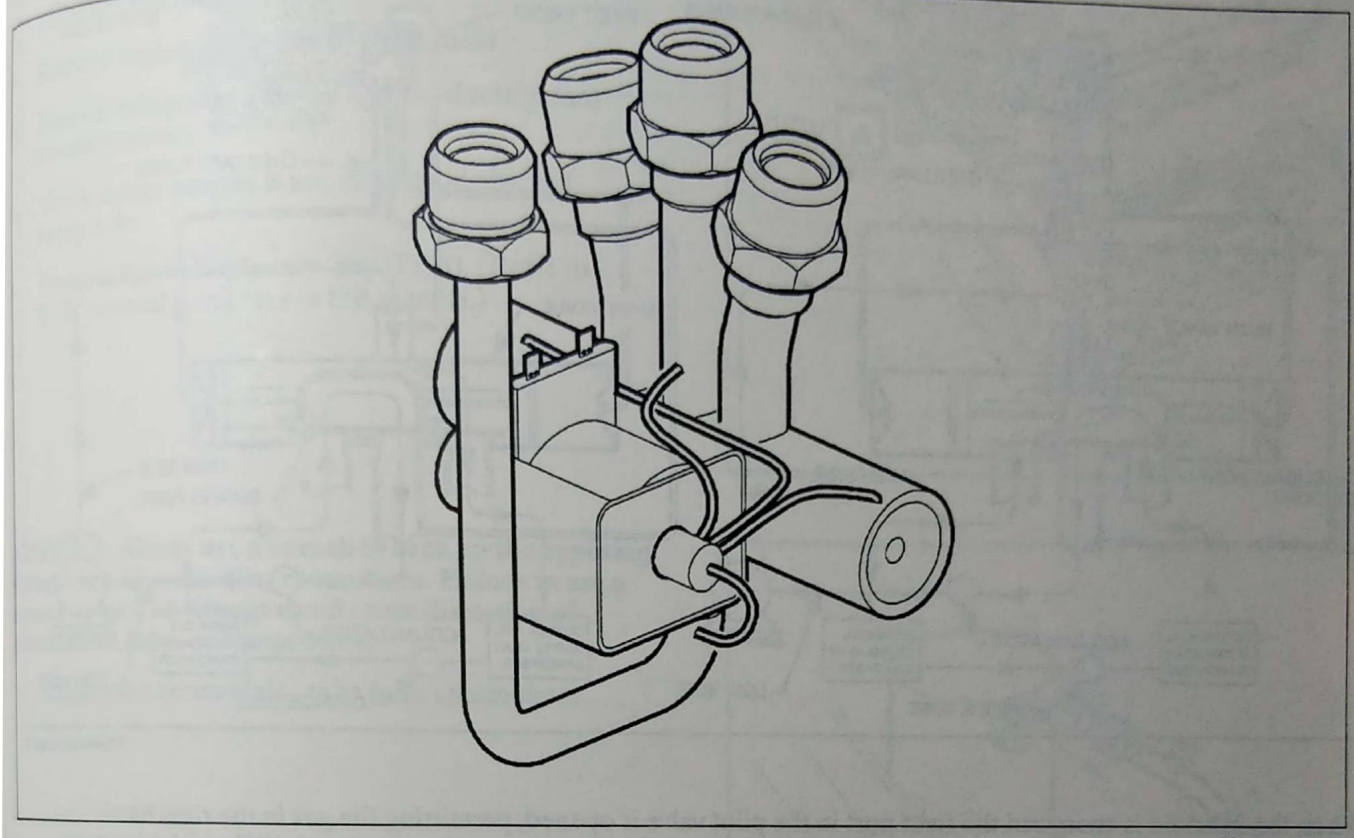
REVERSING VALVE ASSEMBLY



PSMHVC67399AB

GENERAL DESCRIPTION

The reversing valve assemblies purpose is to reverse the refrigerant route through the evaporator and condenser by *7‘nsaskding port assembly, thereby exchanging the functions of the condenser and evaporator for ing-cooling modes. There are three main components to the reversing valve, a pilot valve, a solenoid activated by - volts controlled by the heat pump ventilation system/thermal control module, and the main valve.

The p and cl^01 ValVe *ncorporates two spring loaded opposing needles, actuated by the 12 volt solenoid. The needles open onunc°?e tW° ports and left (d right) in the pilot valve housing, which are connected by means of capillary tubing to PPosrte ends on the main valve body.

When th is closed C So!eno*d is energized, the needle for the right port is retracted, opening the right port, while the left port by tne left needle, which is spring loaded.

When th opened 1^olenoid is de-energized, the right port is closed by the spring loaded right needle and the left port is fte Position of the needles determines the gas escape path from the main valve during reversal.

The main valve has 3 sl*ding port within the housing, it is operated by the pressure differential between the high and low *sides of* the refri Seration system. There at three port tubes on one side of the valve housing. The center port is %nnected h 10 the cond ° the *0W Pressure (suction) side of the system, while the other two tubes are connected to the condenser Tk . £nSer and evaporator assemblies.

*ioi) rt K ^isc tub fc Port On the °PP°site side of the valve housing (not covered by the sliding port) is open to the high harge)<H the evaporator °f the compressor directly through the valve housing, and provides the high pressure path to either r or the condenser, according to operating phase.

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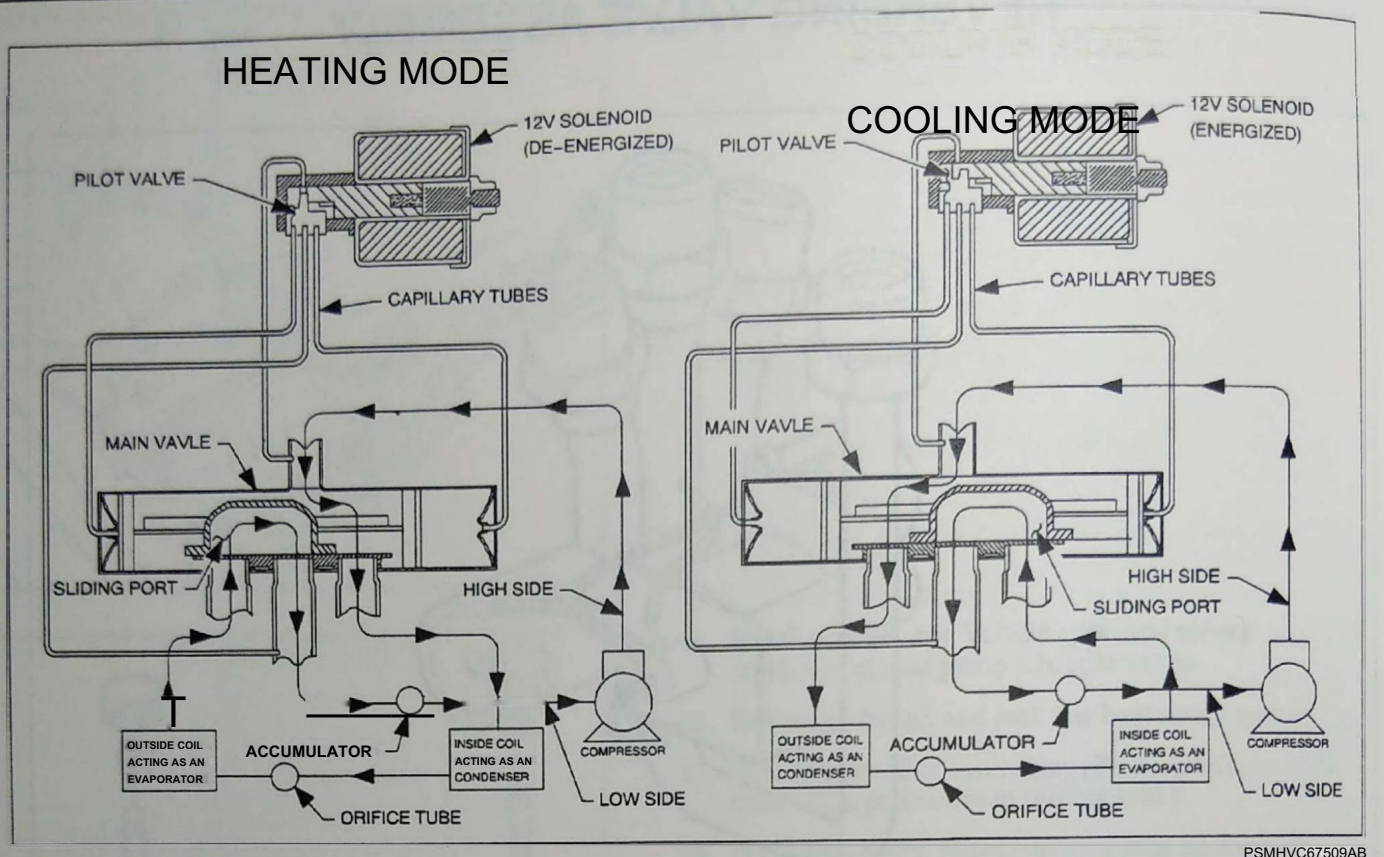

PSMHVC67509AB

When the solenoid is energized the right port in the pilot valve is opened, permitting the gas in the right hand chamber of the main valve to bleed off through the capillary tube, thereby causing a pressure differential between the right and left chambers. The higher pressure in the left hand chamber then causes the sliding port to move to the right. As the sliding port reaches the end of it's travel, a nylon needle in the end of the sliding port piston face seats and seals off the left hand capillary. This will reverse the operation of the heat pump system. When the valve is energized the system is in the cooling mode.

When the solenoid is de-energized the right port in the pilot valve will close and the left port will open, permitting the gas in the left hand camber of the main valve to bleed off through the capillary tube, causing a pressure differential between the left and right chambers. The higher pressure in the right hand chamber causes the sliding port to move to the left. As the sliding port reaches the end of it's travel, a nylon needle in the end of the sliding port piston face seats and seals off the left hand capillary. This will reverse the operation of the heat pump system. When the valve is de-energized the system is in the heating mode.

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A/C ACcUMULATOR ASSEMBLY

HfMOVAL

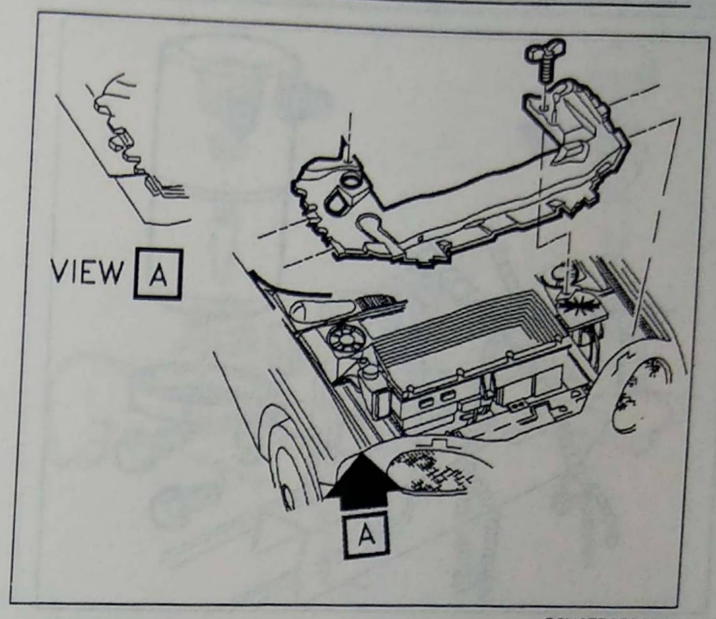
I *place key pad in "LOCK" mode.*

, *Remove engine compartment sight shield.*

3. *Recover refrigerant using an approved refriper^, recovery system.* *"gerant*

4. *Verify charge coupler is not installed in charge receptacle.* *ger*

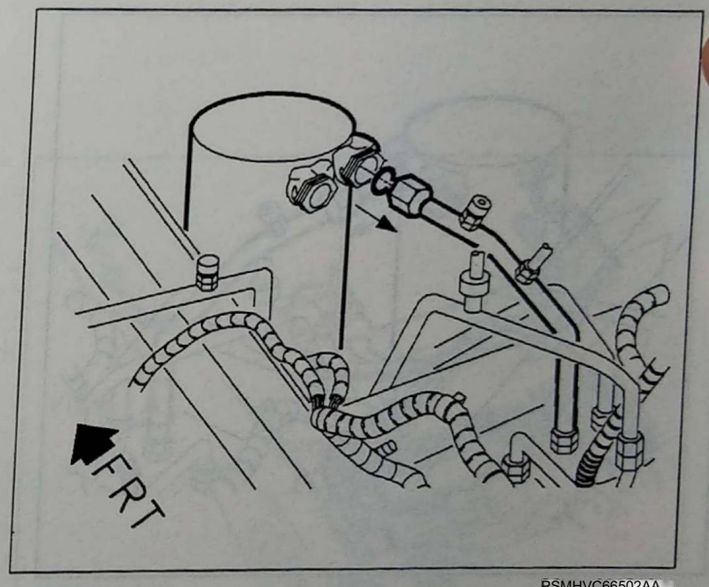
5- *Remove Power Electronics Bay (PEBi* (Re.er *PEB removal procedure in this manual.)* *t0* *f*



PSMGEP65869AC

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

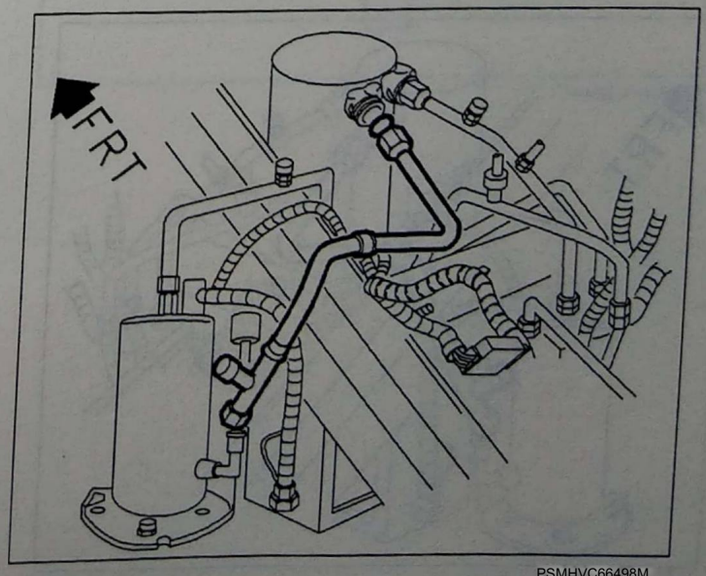
6. Disconnect accumulator tube from accumulator.



PSMHVC66502AA

NOTICE: Always use a wrench to back up the opting fitting when disconnecting connections. Fai u re to r a Wr^nch to back up fittings could cause disto t on of connections, tubes or components.

7. Disco nnect suction tube from accumulator.



PSMHVC66498M

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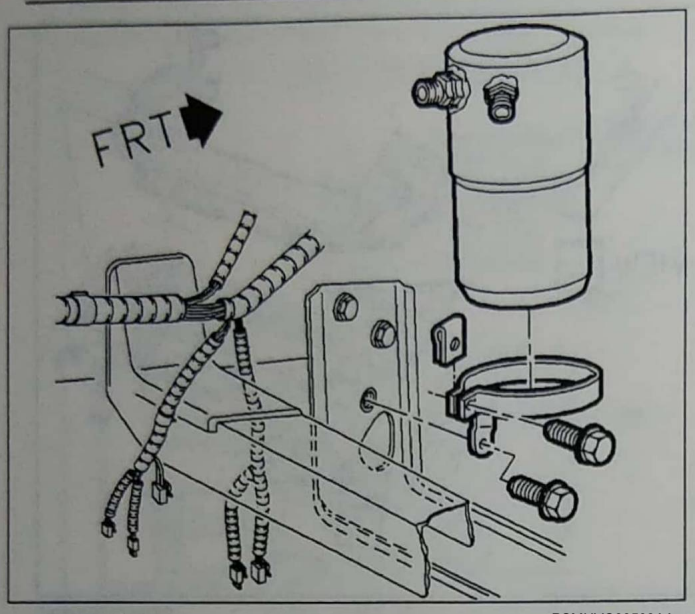


PSMHVC66503AA

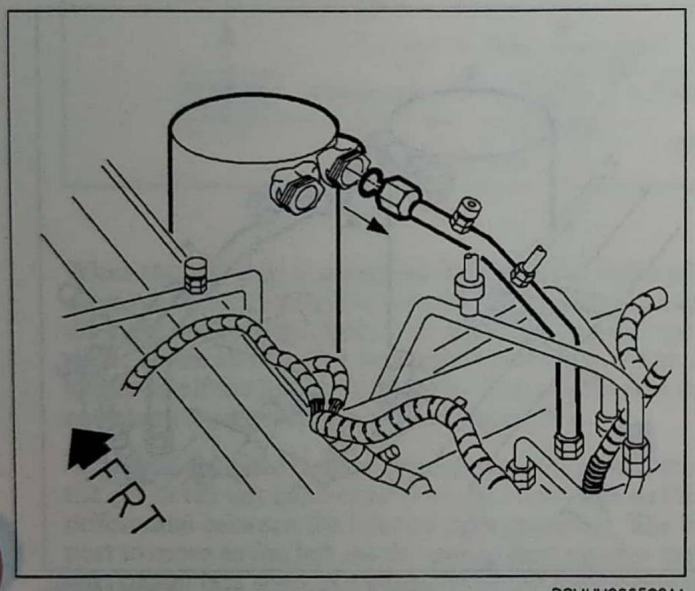
8. Remove accumulator band clamp bolt.
9. Remove accumulator from clamp and vehicle.

INSTALLATION

1. Install accumulator into clamp.

IMPORTANT: Make sure that the coolant recovery check valve and charger receptacle coolant valve wiring is between the front end lower tie bar and under mid-rail and clear of the accumulator and bracket.

2. Remove protective cover from accumulator tube fitting of accumulator.



PSMHVC66502AA

3. Remove O-ring from accumulator tube fitting and install a new Electric Vehicle approved service replacement O-ring.

NOTICE: Use only R-12 Refrigerant oil (mineral) to lubricate O-rings. Use R—134a (PAG) oil or R—134a heat pump (ester) oil will cause premature corrosion of fitting joints.

4. Lubricate O-ring with R-12 mineral refrigerant oil.

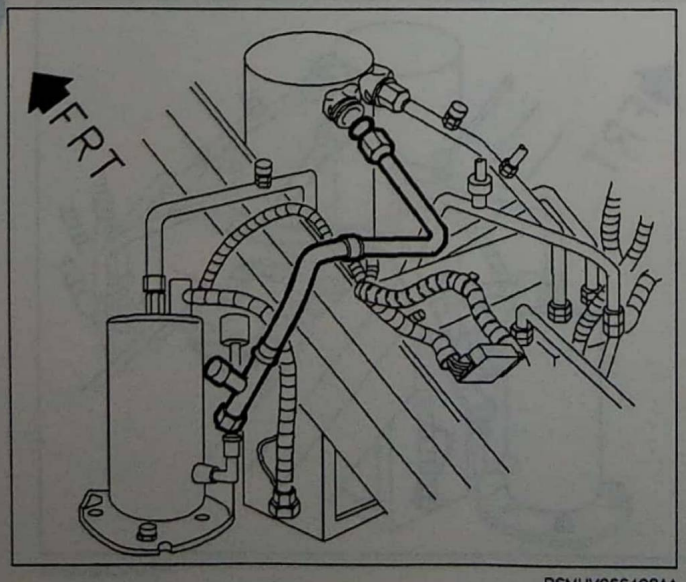
NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

5. Connect accumulator tube to accumulator.

Torque: 20 N-m (15 ft-lbs)

6. Install accumulator band clamp bolt and tighten.

Torque: 10 N*m (89 in-lbs)



PSMHVC66498AA

7. Remove protective cover from suction tube fitting of accumulator.
8. Remove O-ring from suction tube fitting and install a new Electric Vehicle approved service replacement O-ring.

NOTICE: Use only R—12 Refrigerant oil (mineral) to lubricate O-rings. Use R-134a (PAG) oil or R-134a heat pump (ester) oil will cause premature corrosion of fitting joints.

9. Lubricate O-ring with R-12 mineral refrigerant oil.

NOTICE: Always use a wrench to back up the opposing fitting when disconnecting connections. Failure to use a wrench to back up fittings could cause distortion of connections, tubes or components.

10. Connect suction tube to accumulator.

Torque: 20 N«m (15 ft-lbs)

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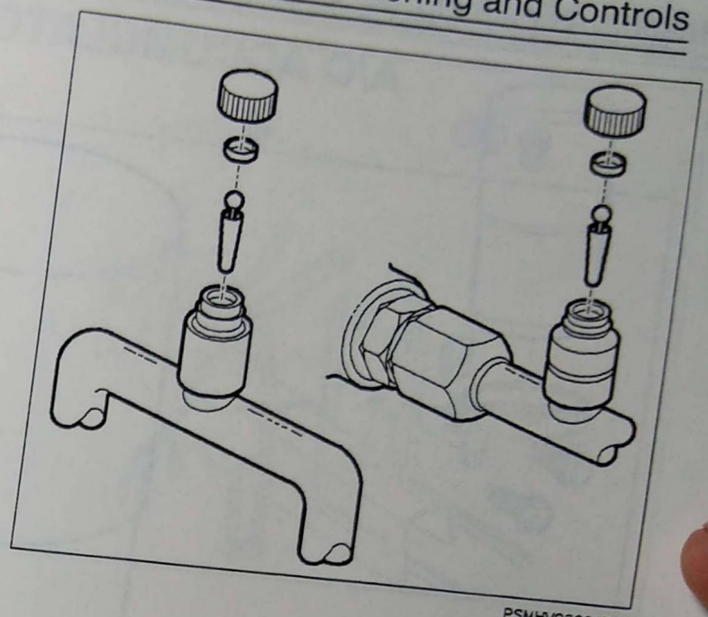
11. Install new Electric Vehicle approved service replacement heat pump schrader valves

12. Evacuate, charge, and leak test heat pump system

13. Install Power Electronics Bay (PEB). (Refer to PEB installation procedure in this manual)

14. Verify heat pump system operation by performing system performance test.



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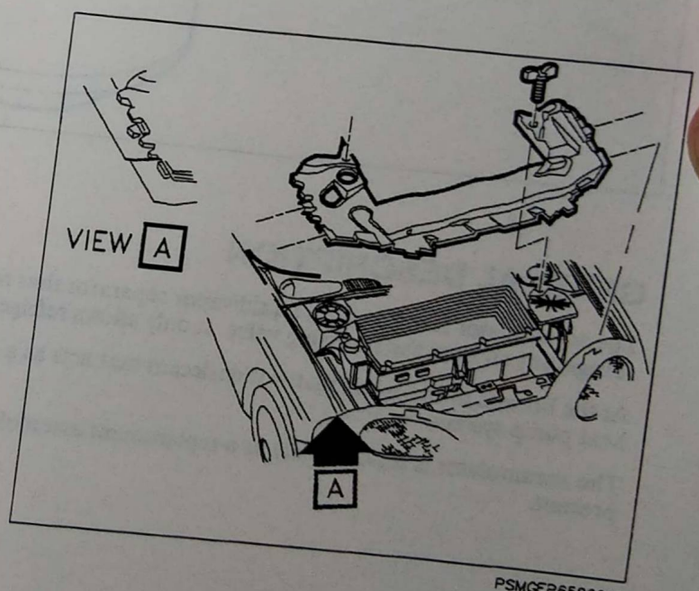

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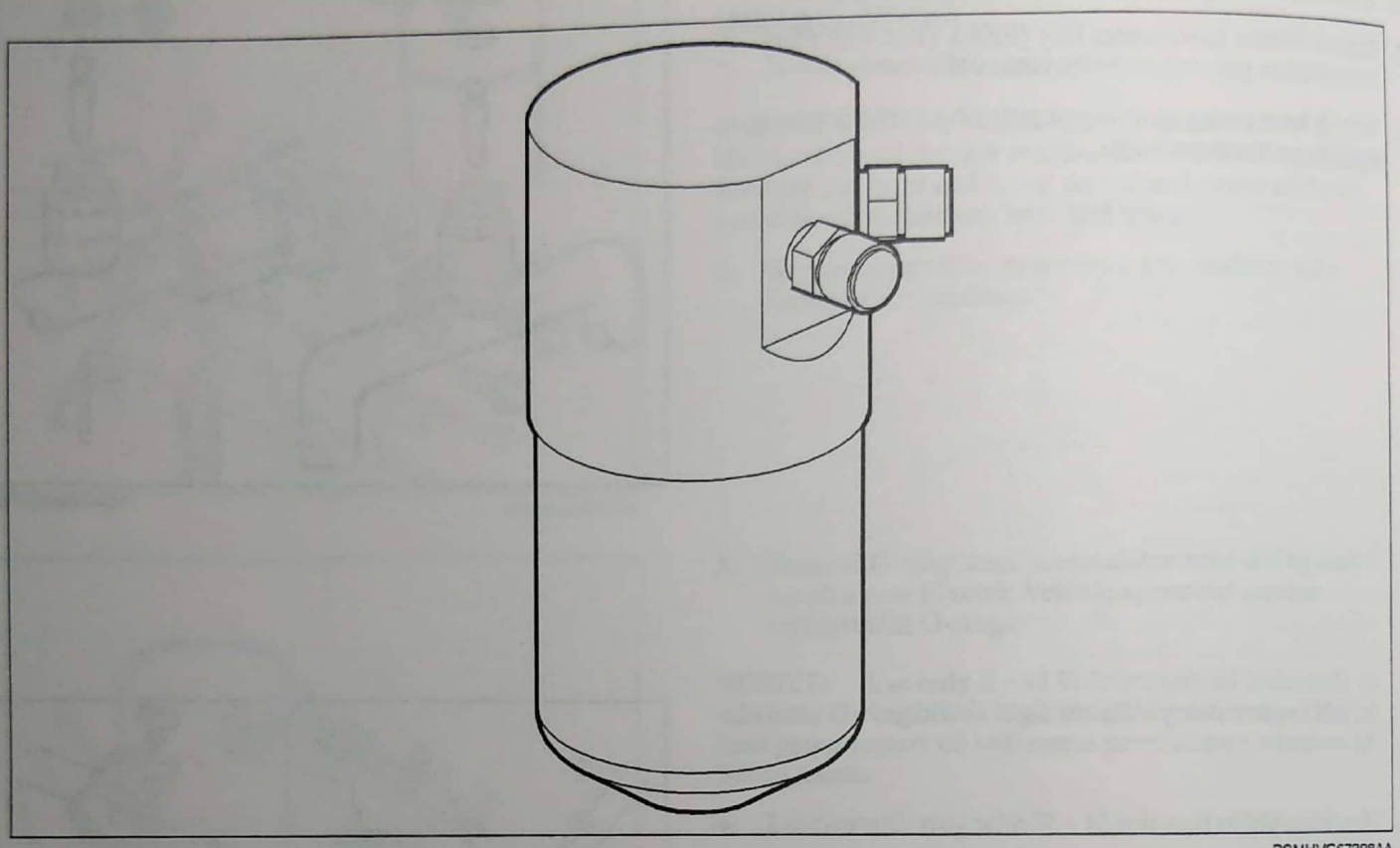
A/C ACCUMULATOR ASSEMBLY



PSMHVC67398AA

GENERAL DESCRIPTION

The accumulator functions as a liquid/vapor separator that receives refrigerant vapor, some liquid refrigerant and refrigerant oil from the reversing valve. It only allows refrigerant vapor and oil to continue on to the compressor.

At the bottom of the accumulator is desiccant that acts as a drying agent for moisture that may have entered the heat pump system.

The accumulator is serviced only as a replacement assembly and should be replaced when ever oil contamination is present.

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/IcCU/VI^LATOR BRACKET

PEMOVAL

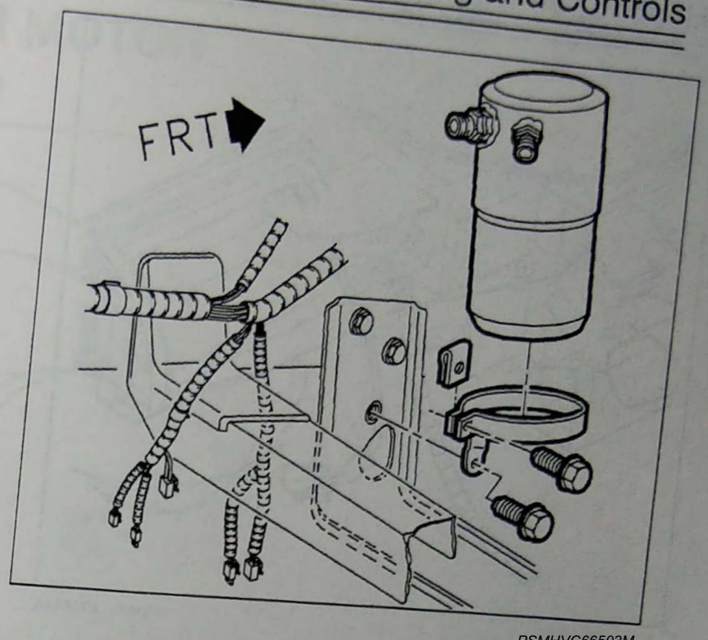
1. Remove accumulator. (Refer to "Accumulat or Assembly removal" in this manual.)
2. Remove accumulator bracket bolt.
3. Remove accumulator bracket from vehicle

INSTALLATION

1. Position accumulator bracket to condenser radian radiator, fan module support.
2. Install accumulator bracket bolt and tighten.

Torque: 10 N«m (89 in-lbs)

3. Install accumulator. ("Refer tn "Accumulator Assembly installation" in this manual.)



PSMHVC66503M

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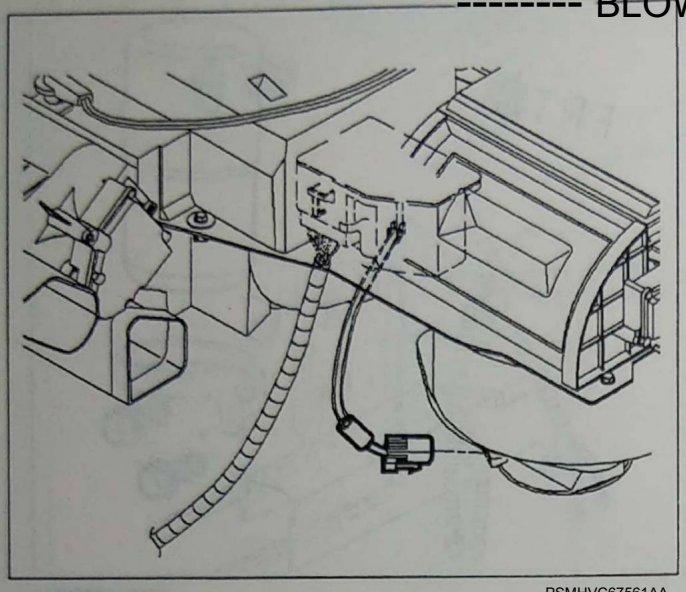
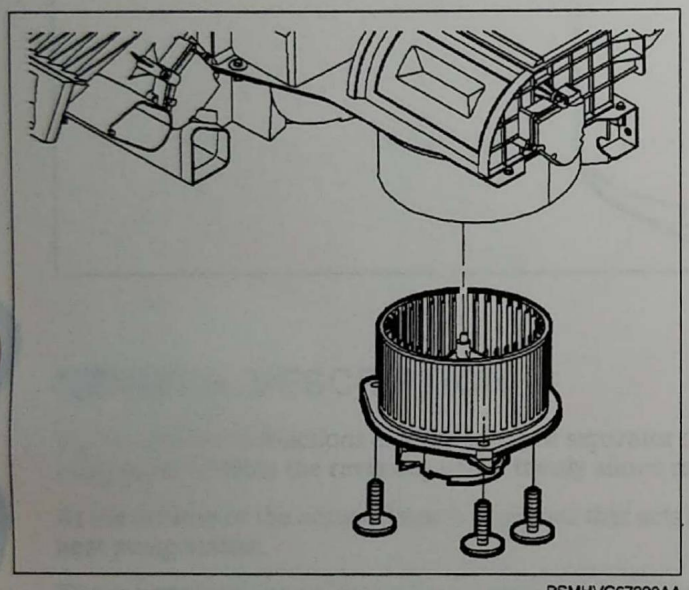
-------- BLOWER MOTOR ASSEMBLY



PSMHVC67561AA

REMOVAL

1. Place keypad on "LOCK" mode.
2. Disconnect blower motor connector.



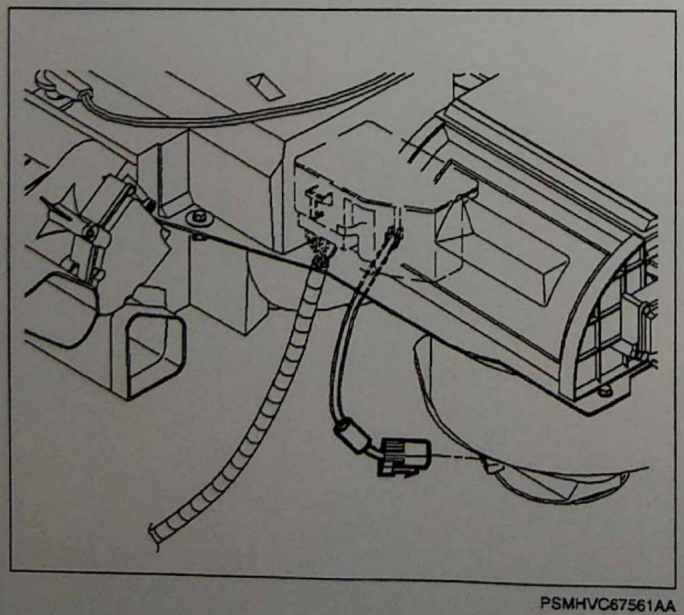
PSMHVC67392AA

3. Remove blower motor mounting screws.
4. Remove blower motor from heating and A/C module.

INSTALLATION

1. Install blower motor into heating and A/C module.
2. Install blower motor mounting screws.

Torque: 1.5 N^e^m (13 in-lbs)



PSMHVC67561AA

3. Connect blower motor connector.

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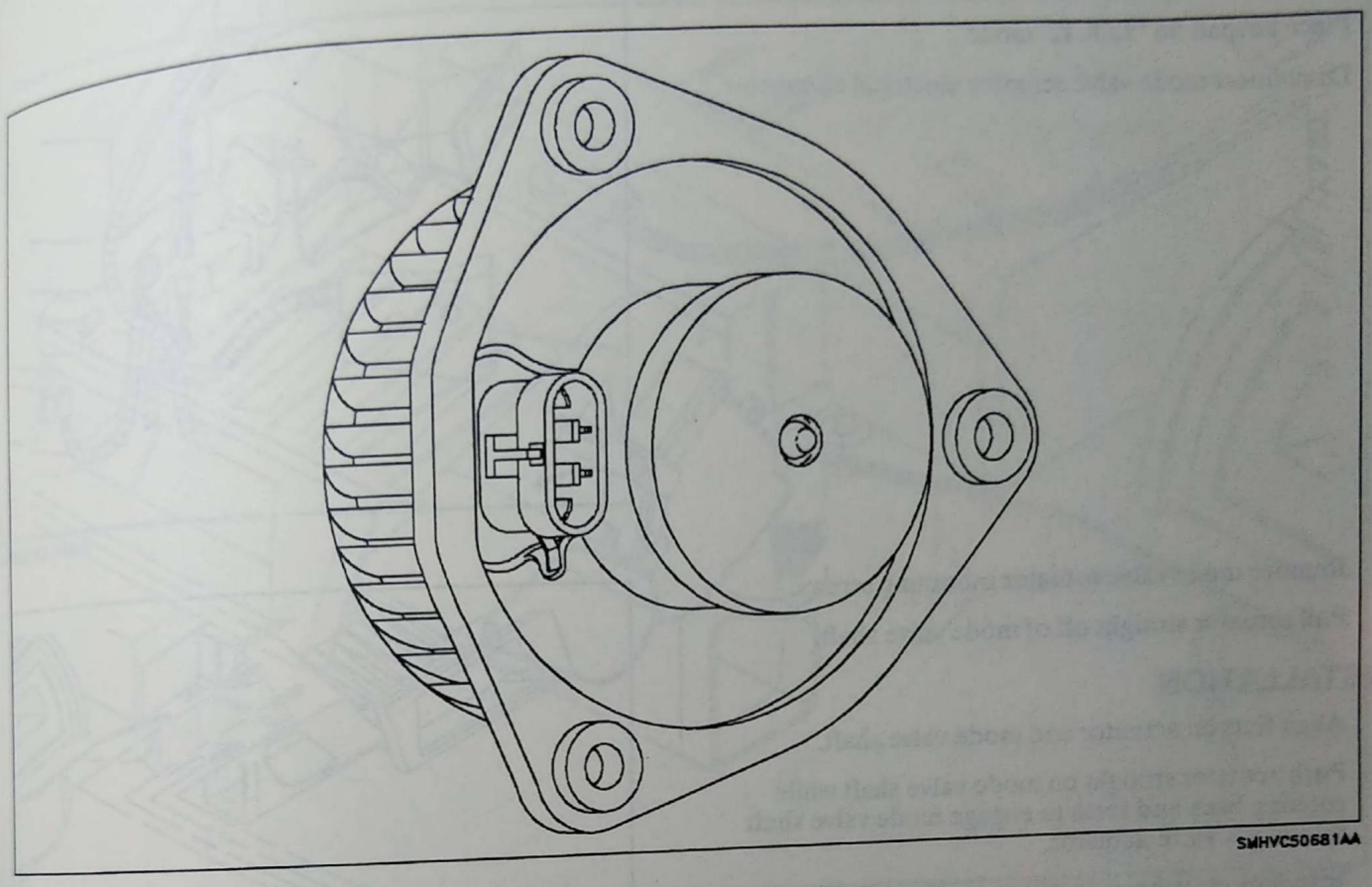
BLOWER MOTOR



GENERAL DESCRIPTION

The blower motor is a permanent magnet motor with a squirrel cage [illegible] i p Hn Tts nuroose is to provide air flow to me Pinger compartment. The blower speeds are controlied by buttoMon uttons on the Run/Lock Shifter assembly (RSA).
There are five speeds for cooling mode and five sligh y tl slower speed for heating mode.
n. 12 vol. blower motor is pulse width moduhrted to control the blower speeds to reduce power consump tion .

The blower motor and fan is a balanced assembly. Weights could be visible on the fan cage.

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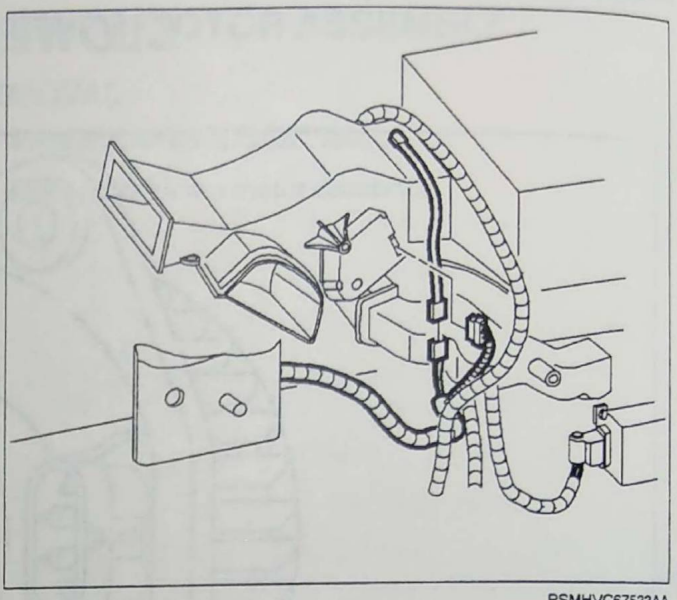
MODE VALVE ACTUATOR ASSEMBLY

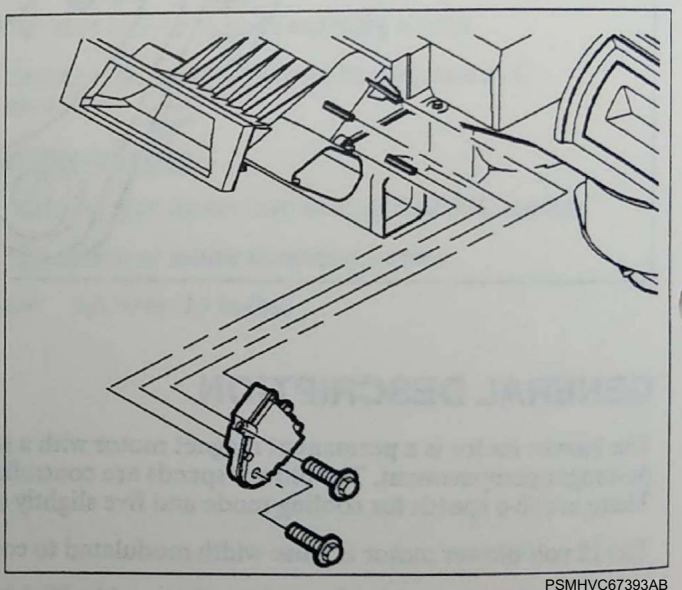
REMOVAL

1. Place keypad on “LOCK” mode.
2. Disconnect mode valve actuator electrical connector.



PSMHVC67533AA

3. Remove mode valve actuator mounting screws.
4. Pull actuator straight off of mode valve shaft.



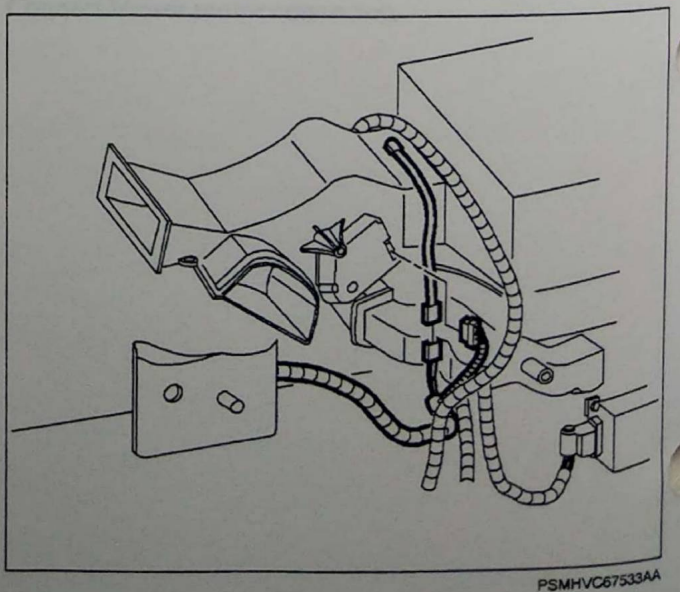
PSMHVC67393AB

INSTALLATION

1. Align flats on actuator and mode valve shaft.
2. Push actuator straight on mode valve shaft while rotating back and forth to engage mode valve shaft into mode valve actuator.
3. Install mode valve actuator mounting screws.

Torque: 1.5 N*m (13 in-lbs)

4. Connect mode valve actuator electrical connector.
5. Remove haz/run/acc/misc fuse from upper fuseblock to reset the feedback signal to the HTCM on power up. Wait one minute from power up for HTCM to reset before turning on heat pump system.



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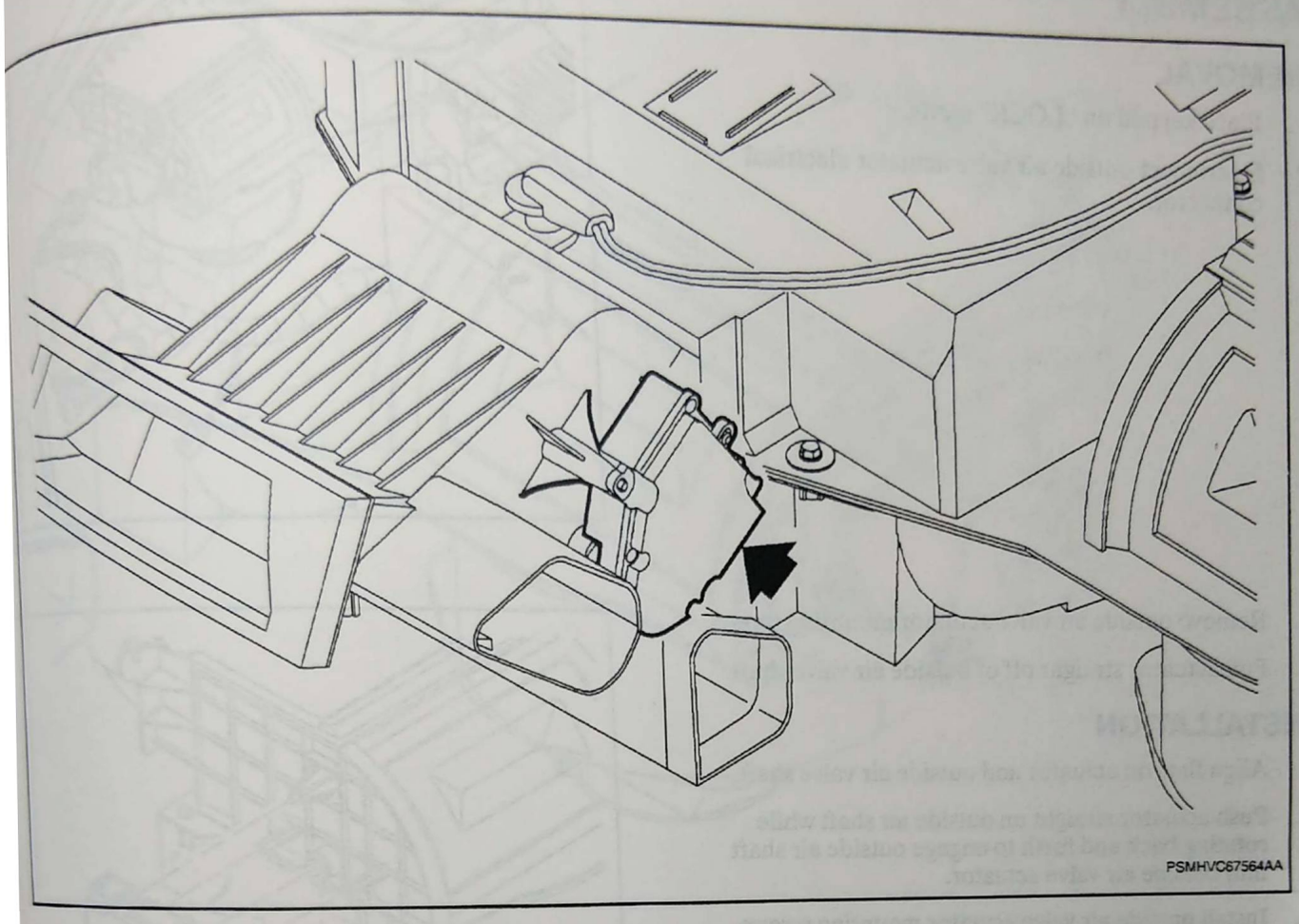
^ODEVALVEACTU ATOR ASSEMBLY



GENERAL DESCRIPTION

The mode valve actuator is a 12 volt electric motor with a 5 volt feedback circuit controlled by the HTCM. The mode valve actuator rotates a door within the heating and A/C module which diverts the air flow from the floor to toe upper outlets in the instrument panel and door panels.

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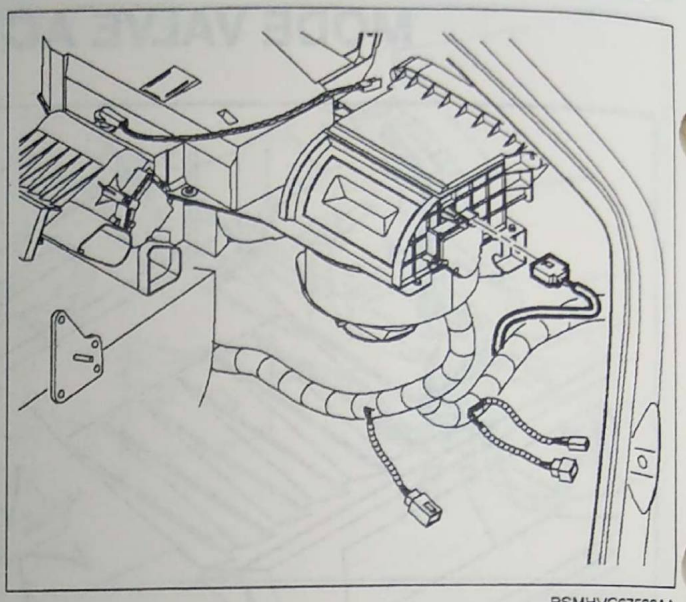
OUTSIDE AIR VALVE ACTUATOR ASSEMBLY

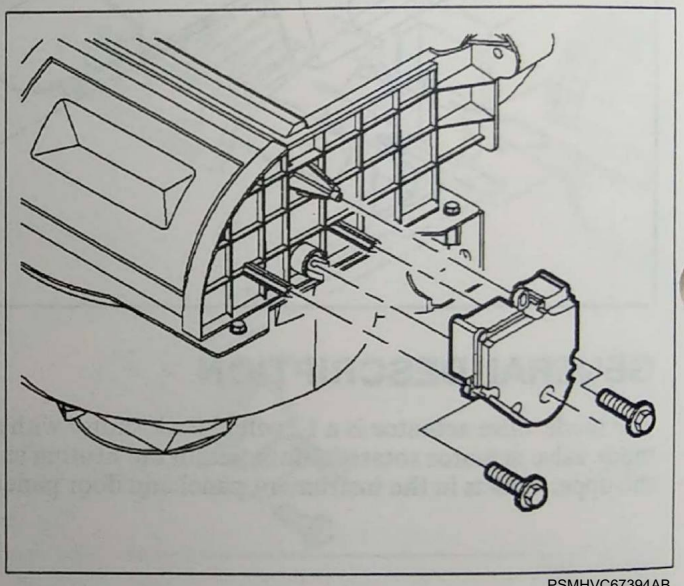
REMOVAL

1. Place keypad on “LOCK” mode.
2. Disconnect outside air valve actuator electrical connector.



PSMHVC67532AA

3. Remove outside air valve actuator mounting screws.
4. Pull actuator straight off of outside air valve shaft.



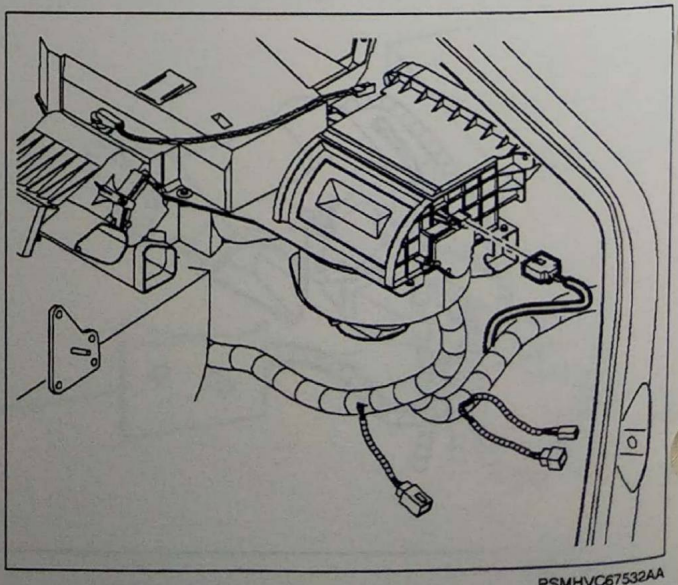
PSMHVC67394AB

INSTALLATION

1. Align flats on actuator and outside air valve shaft.
2. Push actuator straight on outside air shaft while rotating back and forth to engage outside air shaft into outside air valve actuator.
3. Install outside air valve actuator mounting screws.

Torque: 1.5 N*m (13 in-Ibs)

4. Connect outside air valve actuator electrical connector.
5. Remove Haz/Run/Acc/Misc fuse from upper fuseblock to reset the feedback signal to the HTCM on power up. Wait one minute from power up for the HTCM to reset before turning on the heat pump system.



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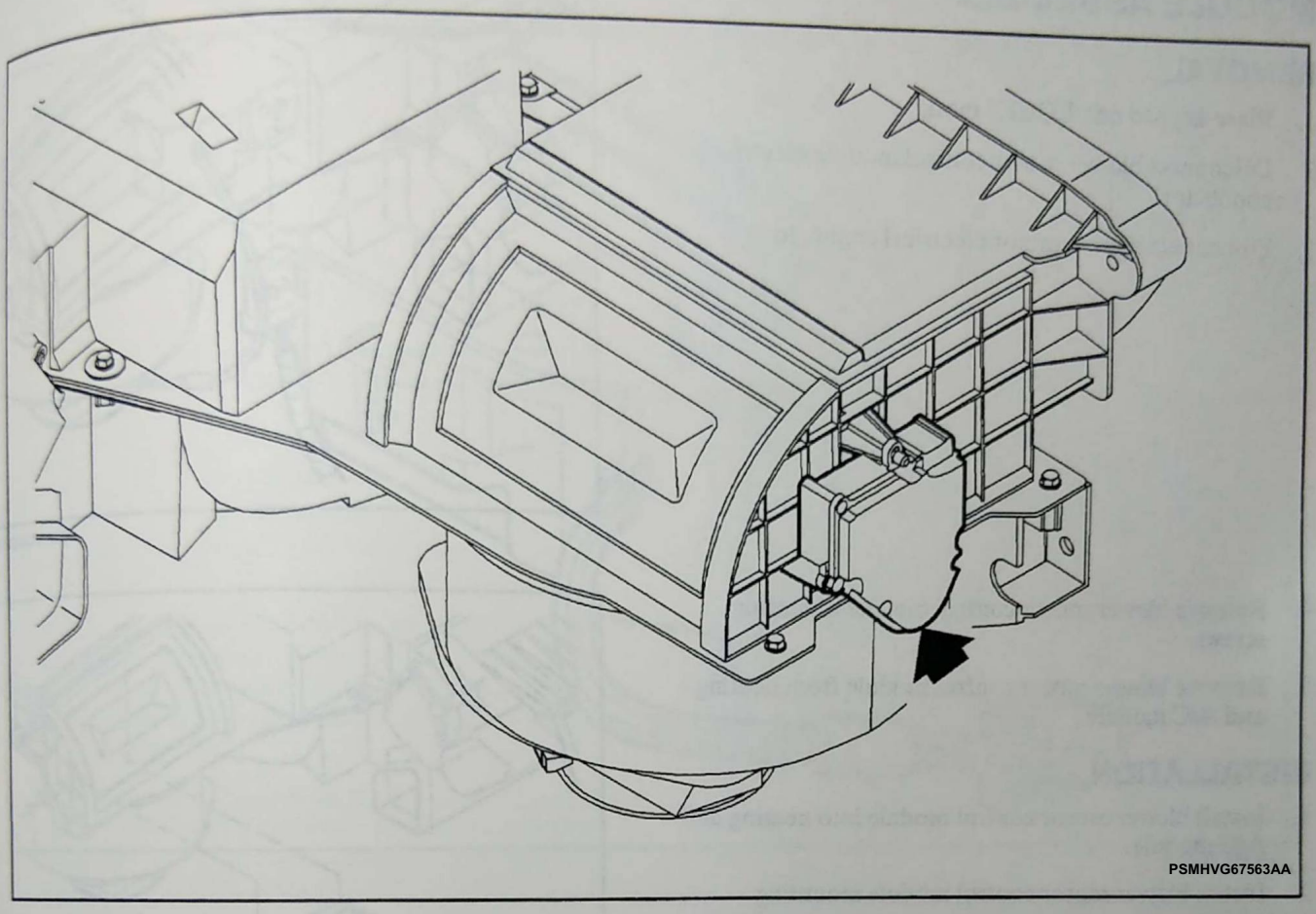
OUTSIDE AIR VALVE ACTUATOR ASSEMBLY



GENERAL DESCRIPTION

The outside air valve actuator is a 12 volt electric motor with a five volt feedback circuit controlled by the HTCM. The outside air valve actuator rotates a door between inside and outside air. When recirculation is activated, the motor allows the air inside the passenger compartment to be drawn back into the heating and A/C module. When ^circulation is not activated, fresh outside air is drawn into the system.

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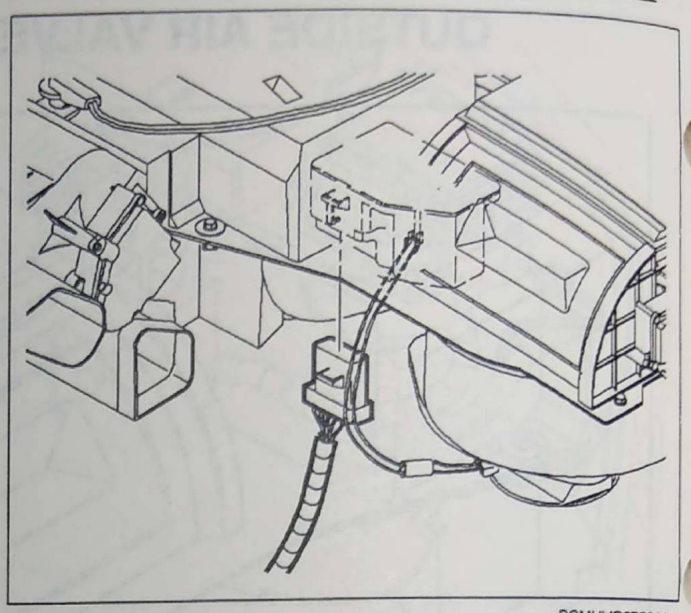
BLOWER MOTOR CONTROL MODULE ASSEMBLY

REMOVAL

1. Place keypad on “LOCK" mode.
2. Disconnect blower motor control module electrical connector.
3. Disconnect blower motor electrical connector.

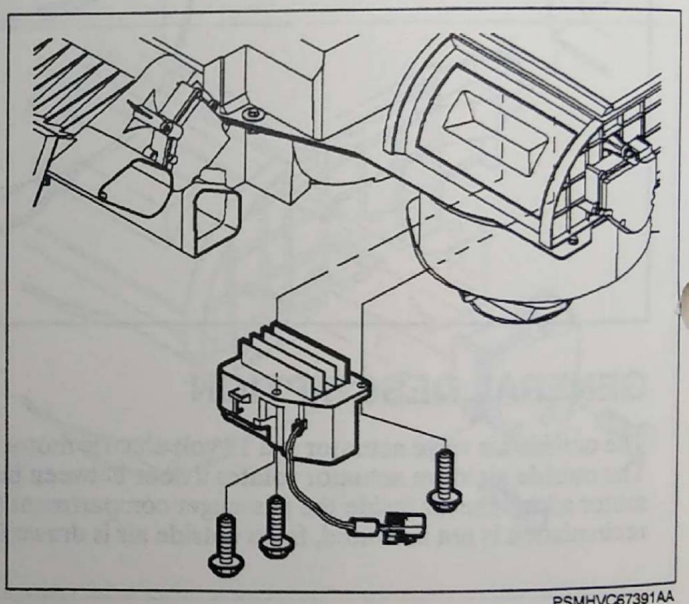

PSMHVC67531AA

4. Remove blower motor control module mounting screws.
5. Remove blower motor control module from heating and A/C module.

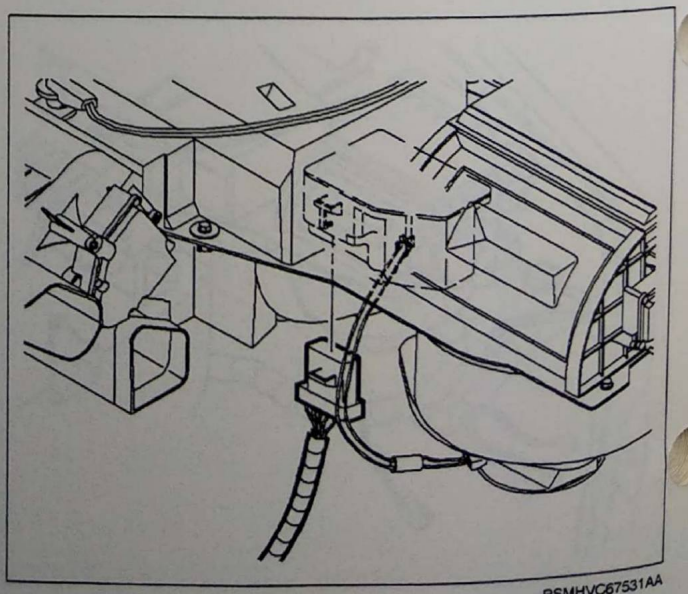
INSTALLATION

1. Install blower motor control module into heating and A/C module.
2. Install blower motor control module mounting screws.

Torque: 1.5 N*m (13 in-lbs)


PSMHVC67391AA

3. Connect blower motor control module electrical connector.
4. Connect blower motor electrical connector.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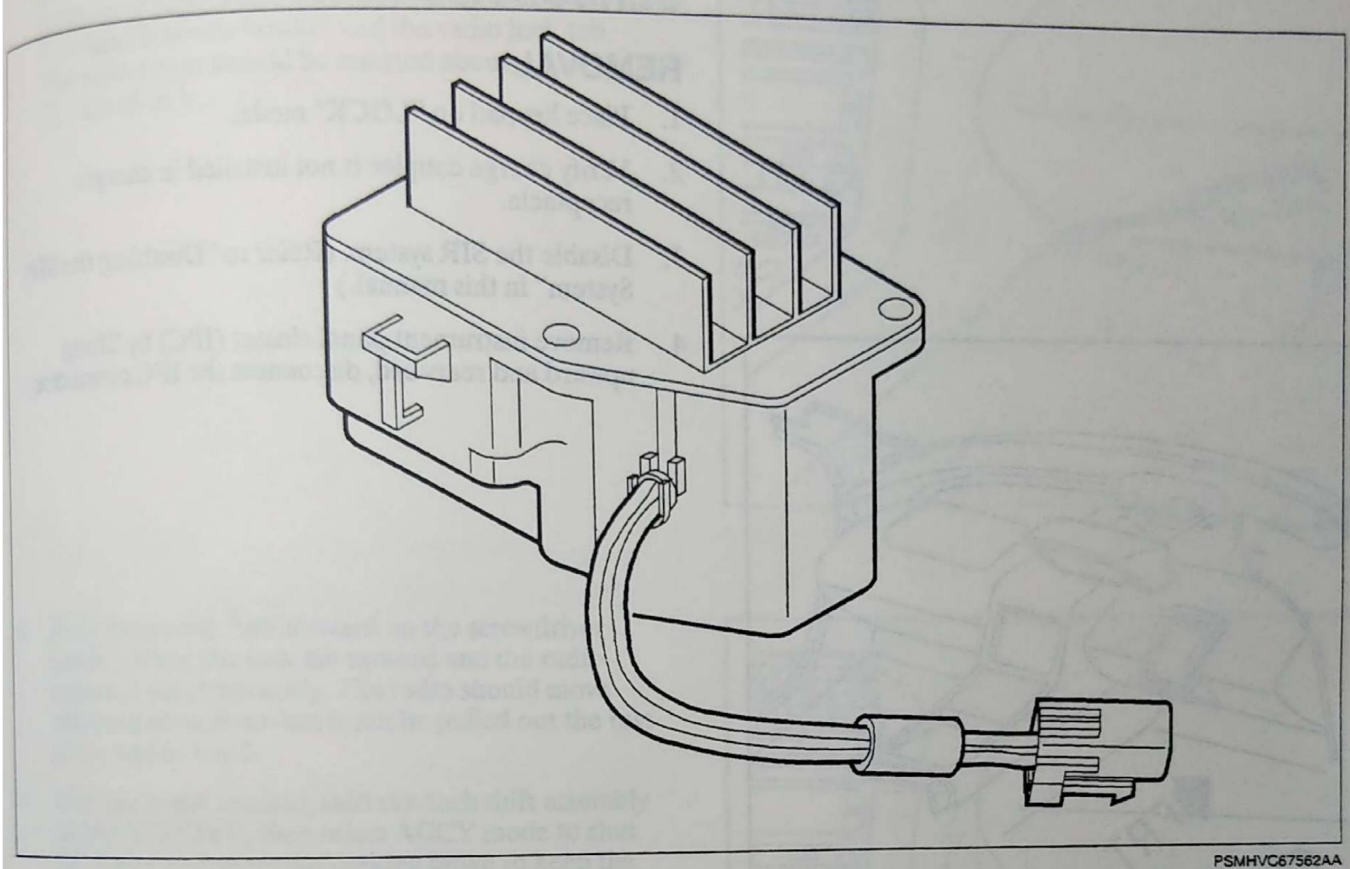
BLOWER MOTOR CONTROL MODULE ASSEMBLY



GENERAL DESCRIPTION

The BMCM is a 12 volt electrical device which receives a blower motor speed command from the HTCM and controls the blower motor speed via a pulse width modulated signal.

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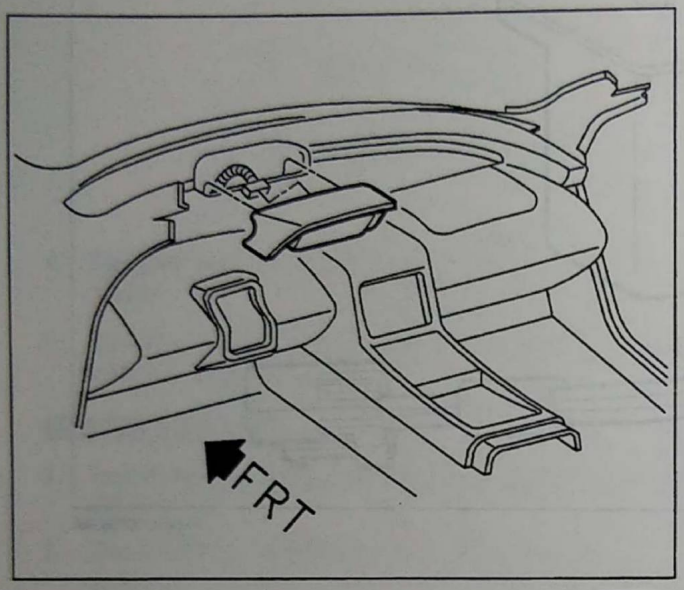
HEAT PUMP VENTALATION MODULE DISCHARGE TEMPERATURE SENSOR ASSEMBLY

REMOVAL

1. Place keypad on “LOCK” mode.
2. Verify charge coupler is not installed in charger receptacle.
3. Disable the SIR system. (Refer to “Disabling the SIR System” in this manual.)
4. Remove instrument panel cluster (IPC) by lifting upward and rearward, disconnect the IPC connector.



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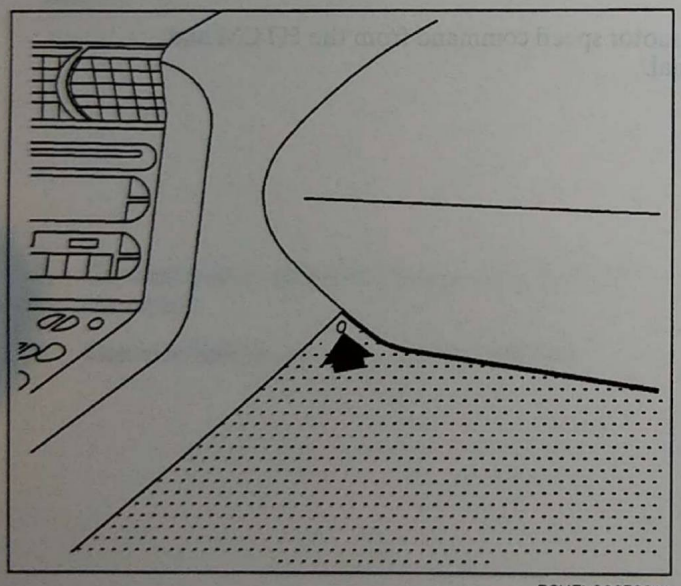

PSMELC66382AA

5. Locate hole in instrument panel tunnel bracket on right side behind carpet.
6. Use a knife to make a small slit in carpet over the hole.

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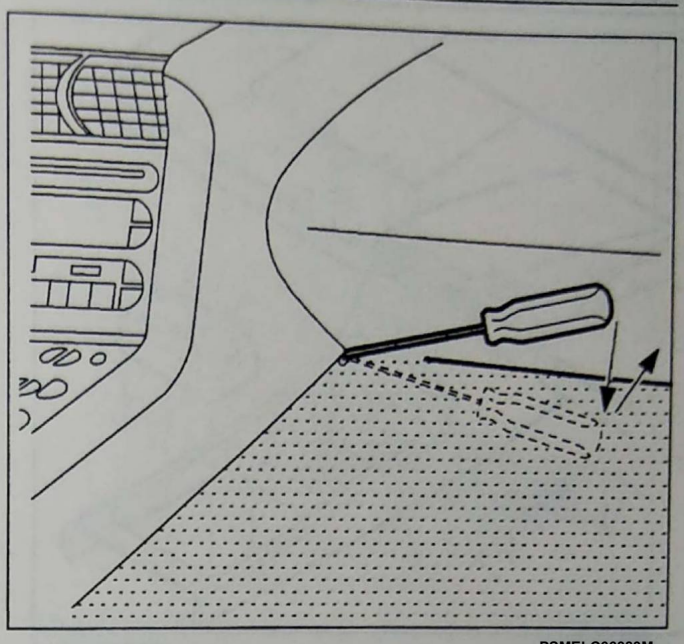
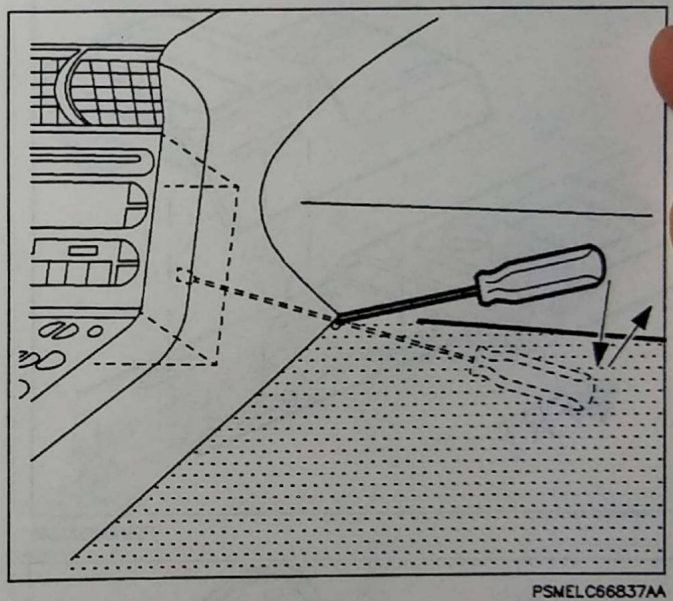
<:Crewdriver with a blade about 152-304 mm ln$ert a . n j) long into the hole in the instrument (6 cl bracket. Slide screwdriver along pane radio bracket until the screwdriver between bracket and the radio lock tab. driver should be inserted about rhe sere* j52tnm( )'



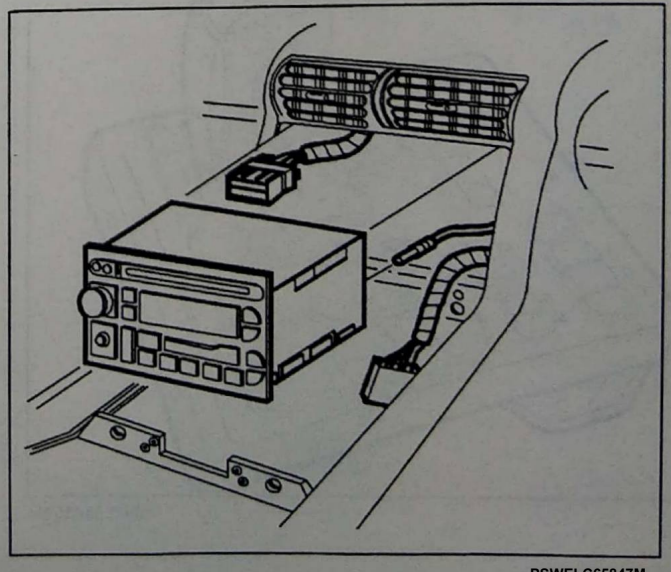
PSMELC66383M

8. Push downward then forward on the screwdriver handle, lifting the lock tab upward and the radio rearward simultaneously. The radio should move rearward enough so that it can be pulled out the rest of the way by hand.
9. With the brake applied, shift run/lock shift assembly (RSA) to DRIVE, then select ACCY mode to shut Off power and apply the parking brake to keep the vehicle from rolling unexpectedly.
10. Lay a clean shop rag over the RSA to help protect it from getting scratched by the radio case during radio removal.
11. Slide radio out of instrument panel.



PSMELC66837AA

12. Disconnect the antenna lead first, then the harness connector.
13. With the brake applied, select the RUN mode again, and shift back to PARK. Then select the lock mode to turn the vehicle Off.



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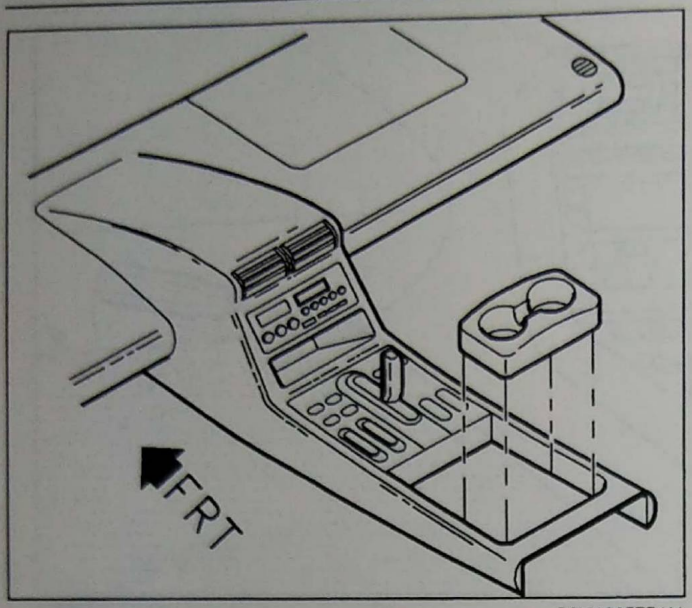
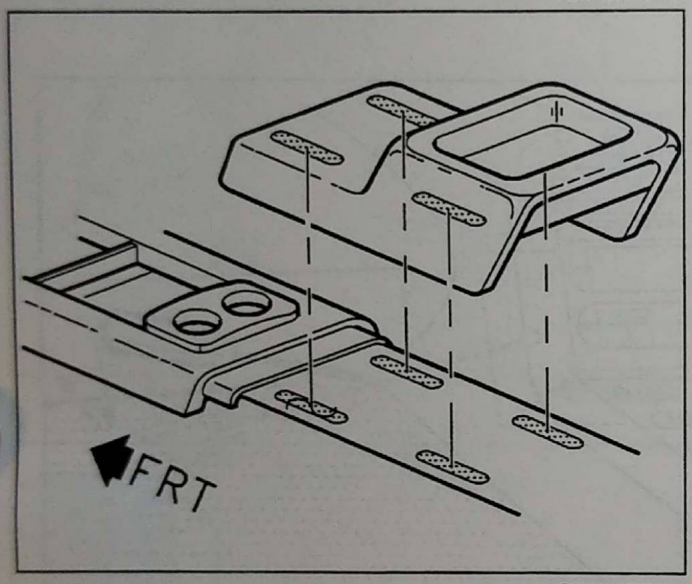


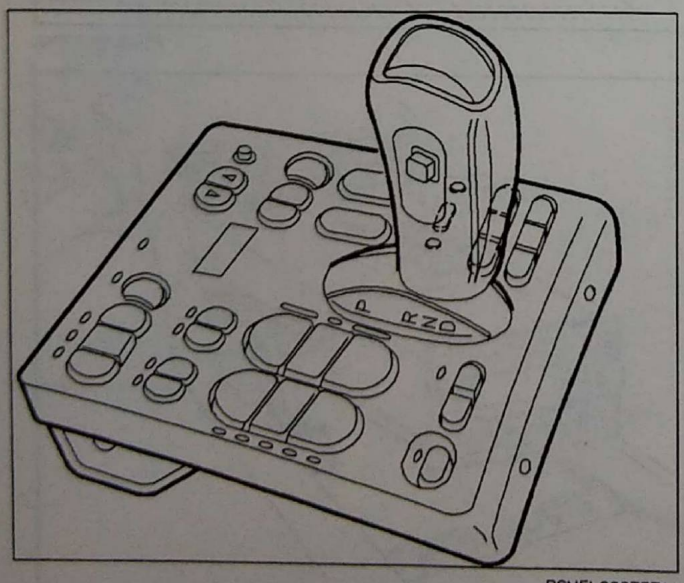
PSMMS65734AA

14. Remove cup holder.



PSMMS65735AA

15. Remove arm rest from tunnel by lifting upward releasing Dual-Lock retainers.



PSMELC66357AA

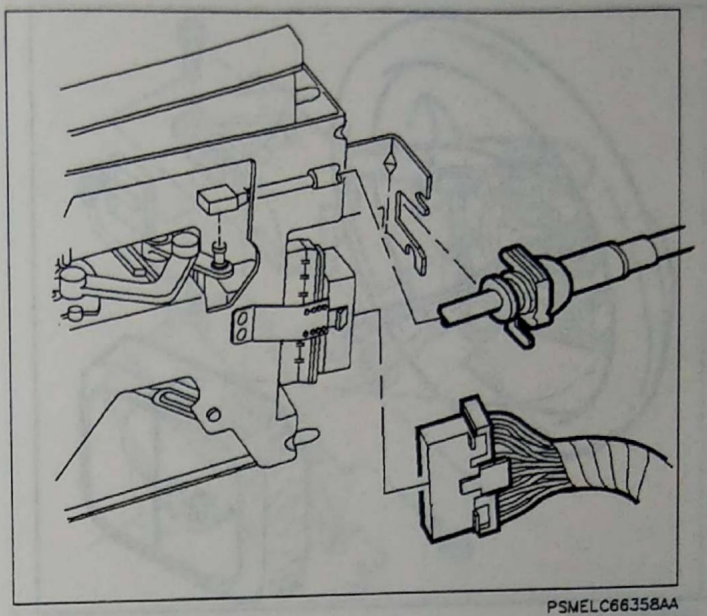
16. Remove the T—25 TORX™ screws in the rear of the RSA, pull RSA rearward about 63 mm (2.5 in.).

CamScanner

^^.ards the drivers side of rhe vehicle to

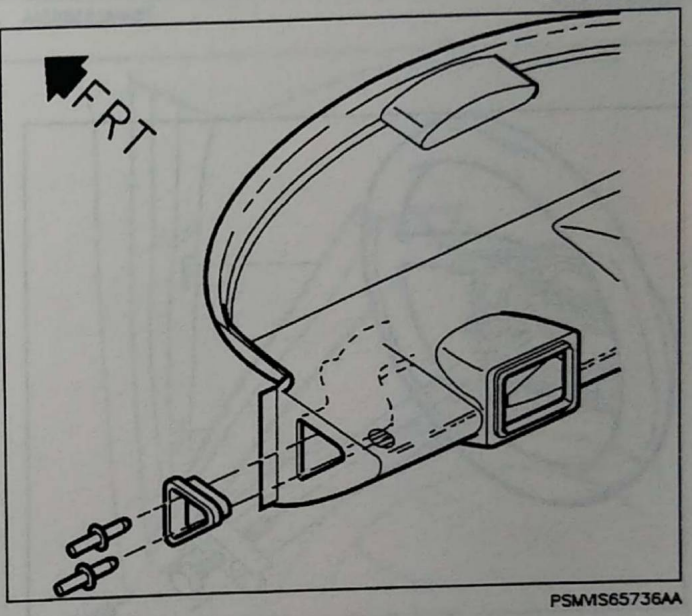
^C R reeangle-
*45
, thc RSA harness connector.

18 pisC○nnCC' u hift cable from the shifter and
nisconnect the ah Sf* from retainer bracket by prying
"*“d b Xe “ide of RSA gently and
l^"* ile down out of bracket.
pushing


PSMELC66358AA

20 Drill out rivets from side door air outlets.

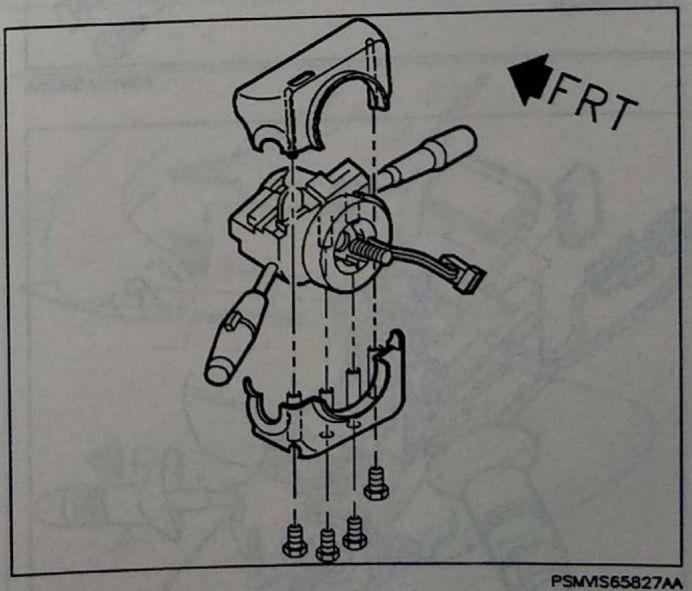
,i Remove left and right front side door air outlets on the side of instrument panel with doors open.



PSMMS65736AA

22. Remove outer screws from lower steering column trim cover, lift upper trim panel off.

23. Remove inner screws from lower steering column trim cover and remove lower trim cover.



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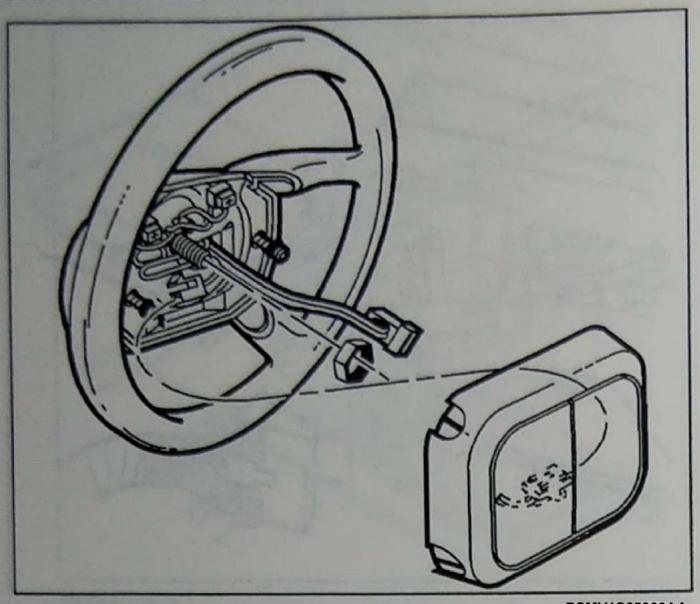
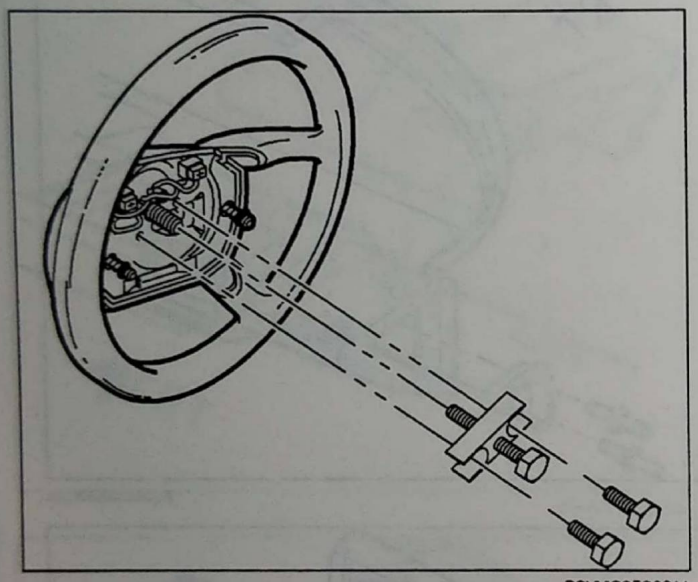


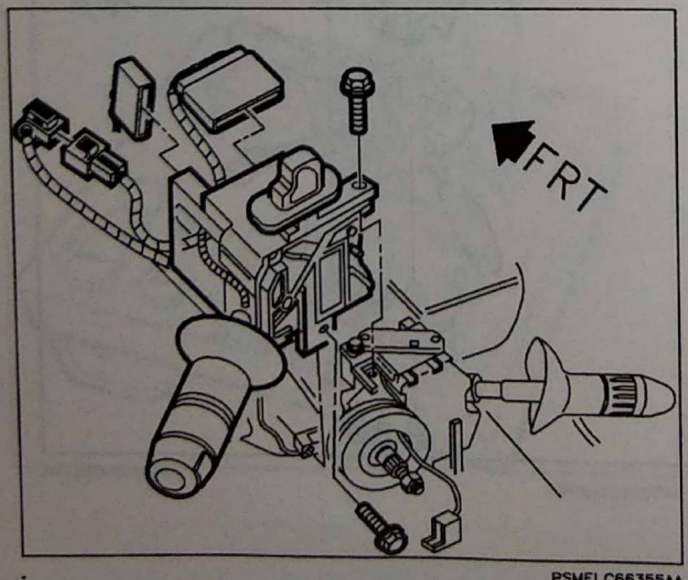
PSMV1S65863AA

24. Remove screws from back of steering wheel that retains SIR inflator module.
25. Remove connector position assurance (CPA) and disconnect inflator module connector.
26. Remove SIR inflator module.



PSMV1S65862AA

27. Disconnect horn switch connector.
28. Remove nut from steering column that retains steering wheel.
29. Install steering wheel puller SA9218NE and remove steering wheel.



PSMELC66355AA

30. Remove T—25 TORX ™ /7mm screws from turn signal, headlamp, and cruise switch.
31. Remove switch and disconnect switch connectors.

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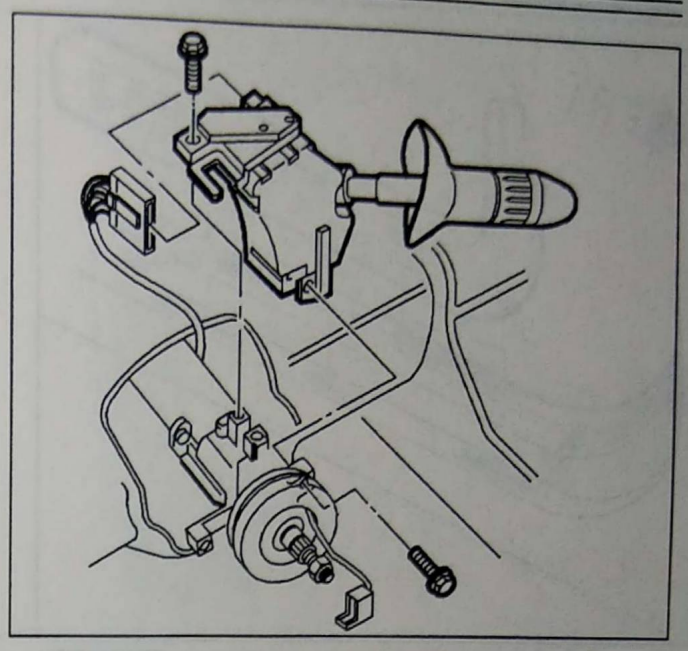
/S'

32. Remove T-25 TORX ~ /7mm screws from windshield washer switch.

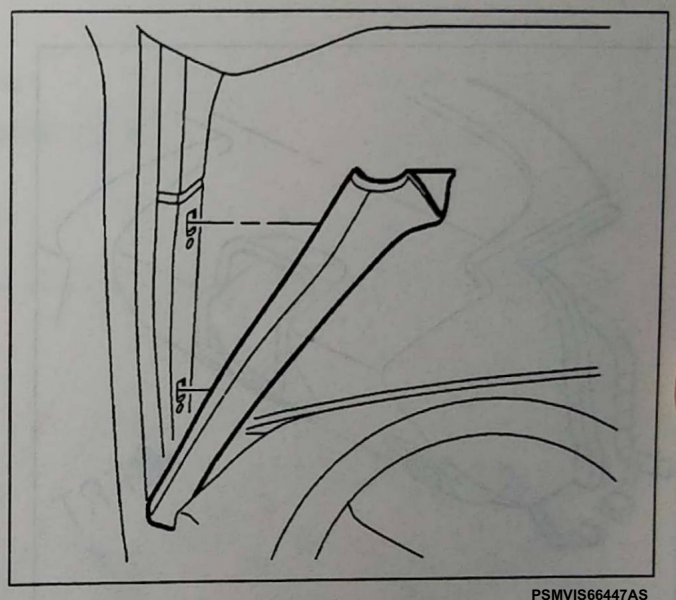
- connector and remove switch.

j3. pi*onne



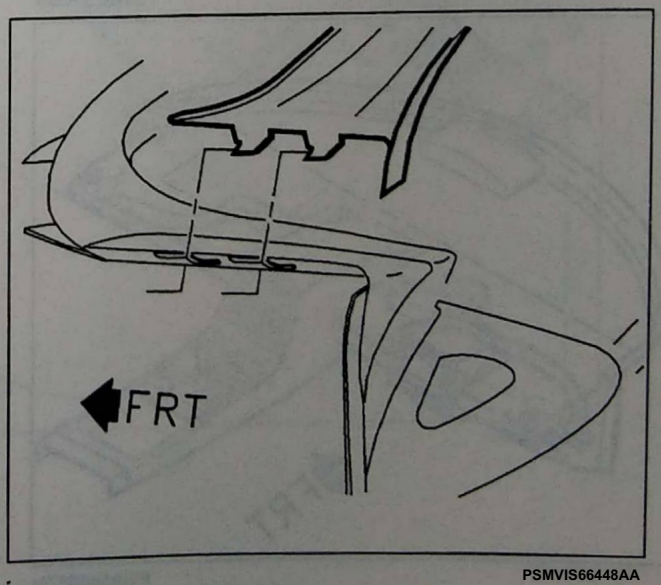
PSMELC66356M

34. Starting at top of garnish molding, pull firmly at clip locations to disengage. Tipping the top of molding inward with the bottom engaged to instrument.



PSMVIS66447AS

35. Disengage tabs on garnish molding from instrument panel by pulling rearward and inboard.



PSMVIS66448AA

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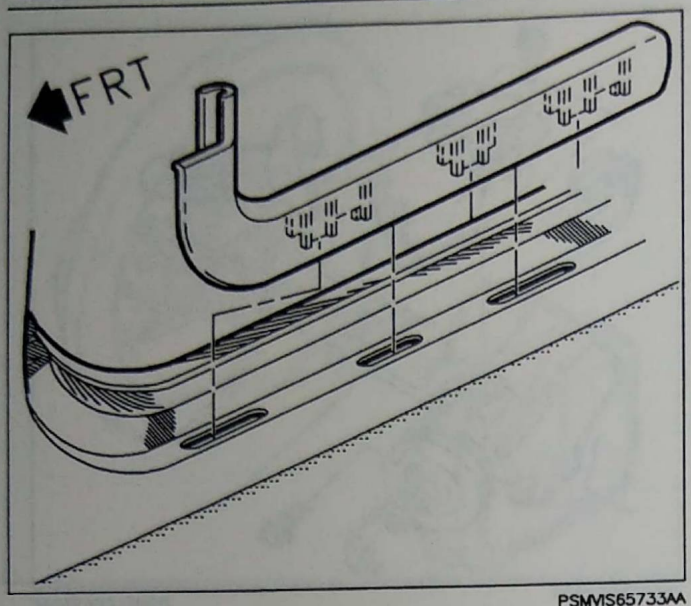
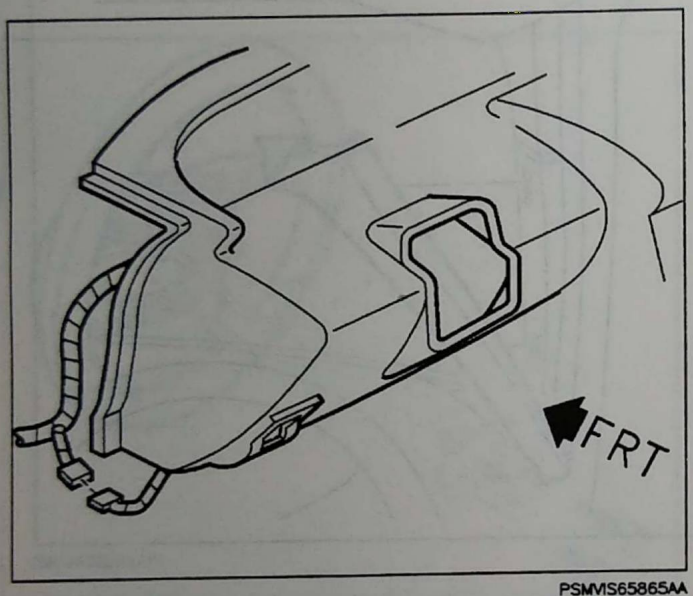


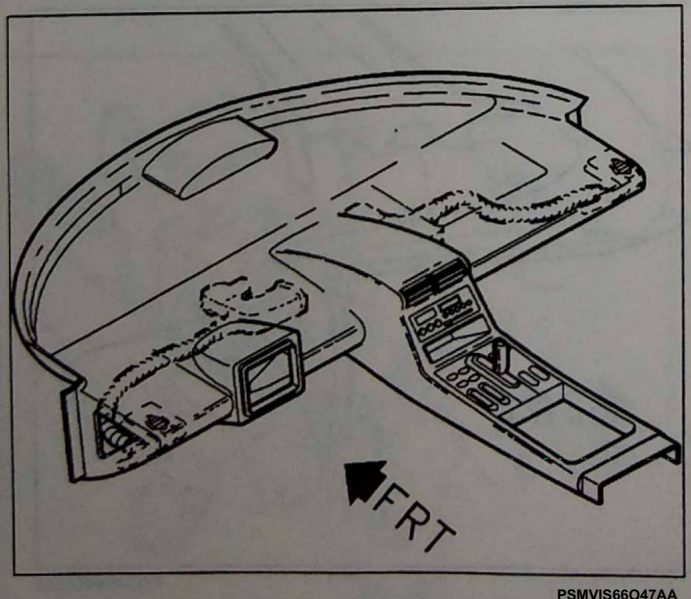
PSMVIS65733AA

36. Starting at rear of carpet retainer, pull firmly on carpet retainer at clip locations to disengage clips.
37. Remove front side door opening floor carpet retainer.



PSMVIS65865AA

38. Disconnect parking brake switch connector.



PSMVIS66O47AA

39. Disconnect side window demistor tubes from floor outlets.

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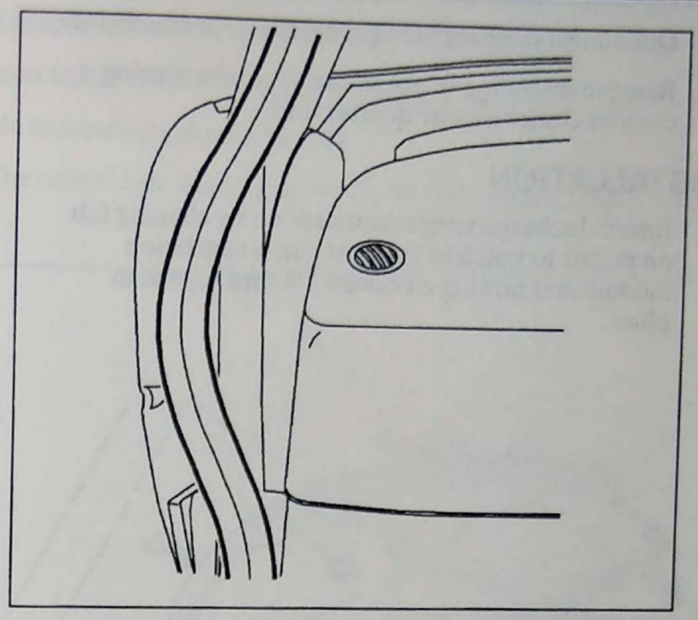
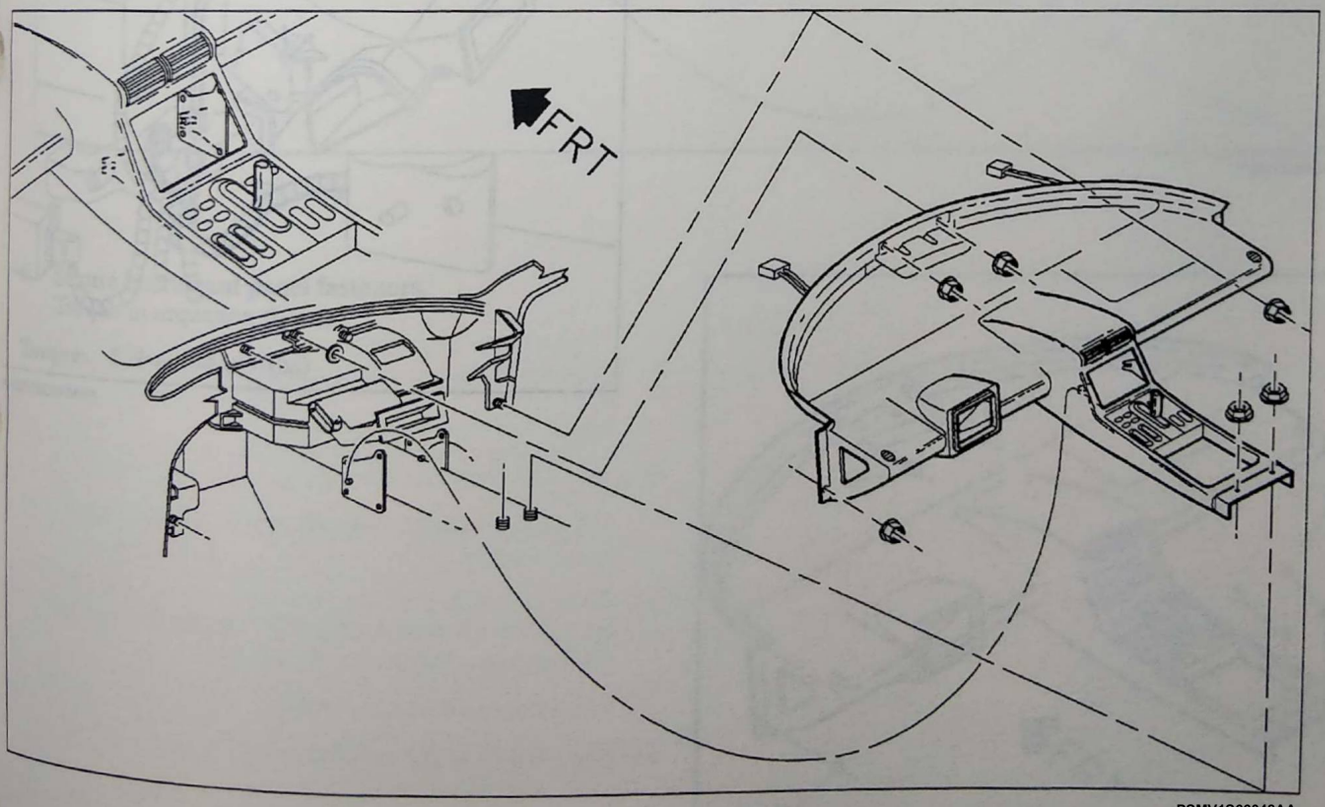
40. Remove side door weatherstrip from pinch weld flange near instrument panel.



PSMVIS66337AA

41. Remove retainers from instrument panel.
42. Pull instrument panel rearward with slight upward pressure.
43. Pull driver's side demister tube through hole in steering column support
44. Disconnect both information telltale connectors.
45. Remove instrument panel from vehicle.



PSMV1S66048AA

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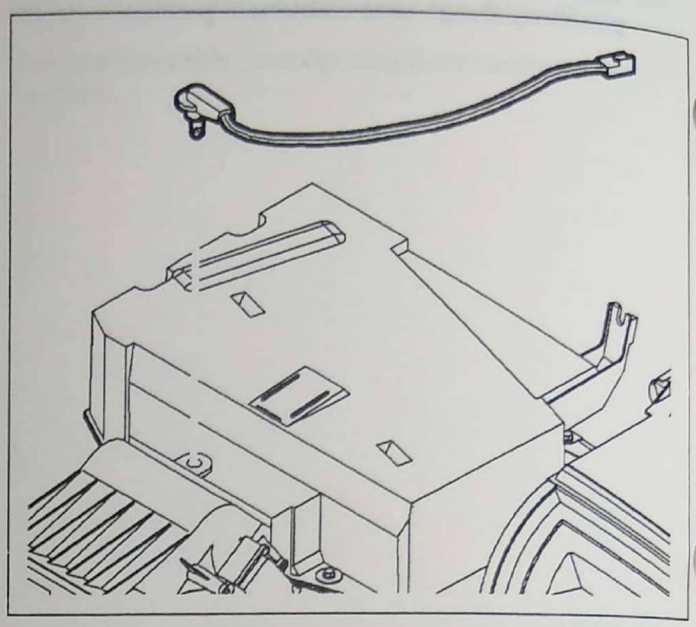
46. Disconnect discharge temperature sensor connector.
47. Remove discharge temperature sensor by turning counter clockwise one quarter turn.

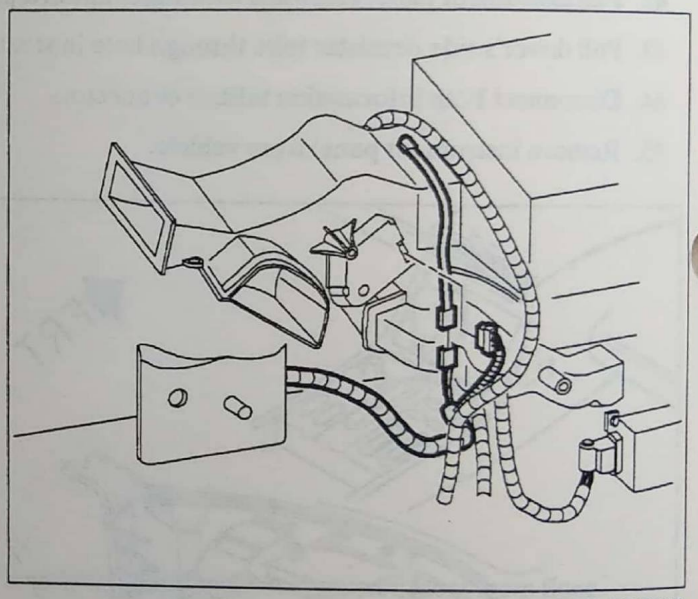


PSMHVC67395AA

INSTALLATION

1. Install discharge temperature sensor by aligning tab on sensor to notch in the heat pump venalation module and turning clockwise 1/4 turn to lock in place.

2. Connect discharge temperature sensor connector.



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^=====---------- ========^^^*til a tin*

i)(f0W ANT. Before assem W i„g make sure spacer is in ^^*Co^ition^* Refer io

; *.«««. panel in location and connect infori Proper >^< io *Z^~======*

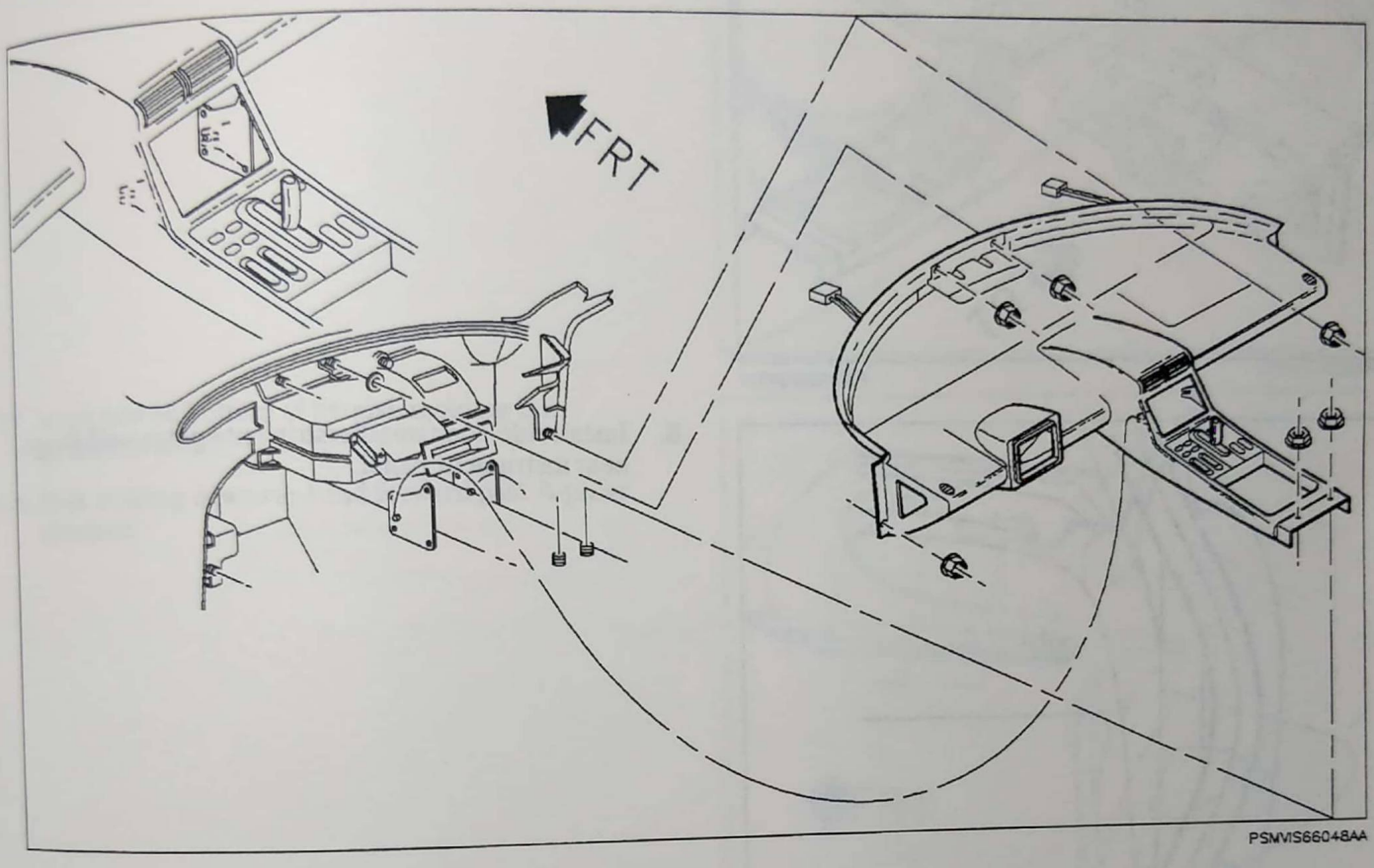
, (cu, de driver's side demister tube i„t0 an<J ”a"°" Whale co„neclors to i"«<rat~?^^=

through umn support.

5 *Install instrument panel over studs on f ront Bering col*

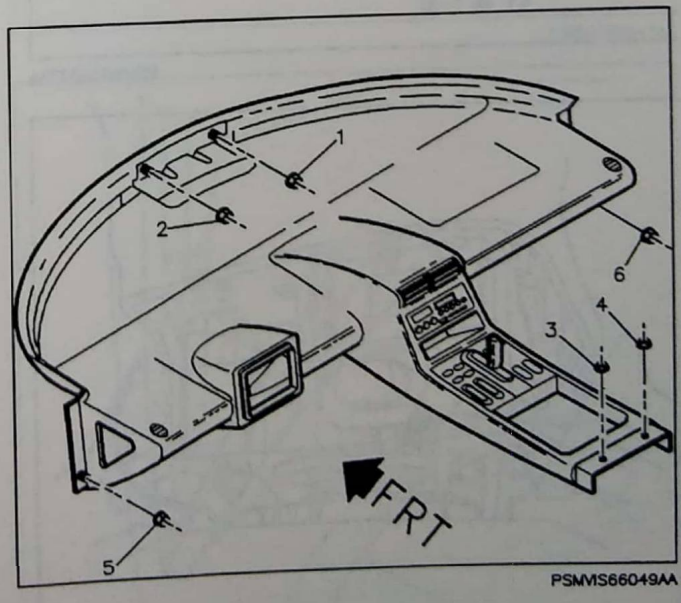
pane! has to he located „„ when £*«h The tunne, J s J *°a'mP,KWC^^O fwbich' hc*

instrument



6. Secure instrument panel fasteners.
Torque in sequence shown.

Torque: 5 N*m (44 in —lbs)



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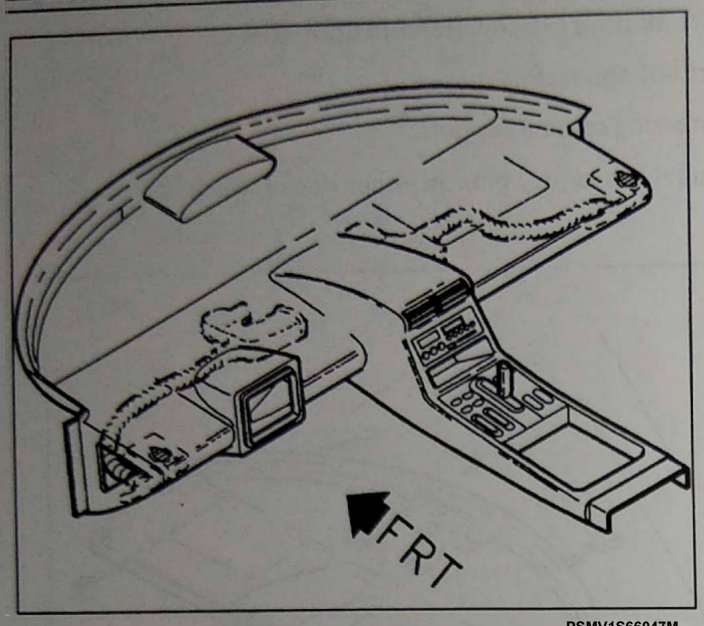
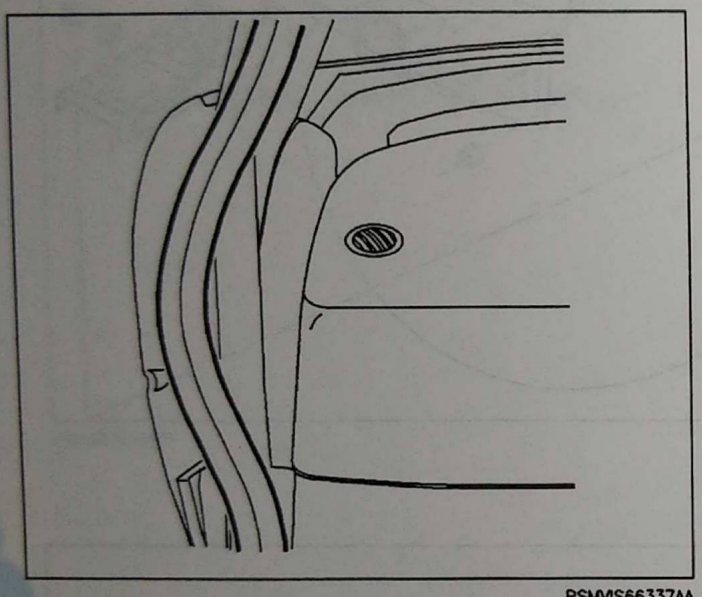


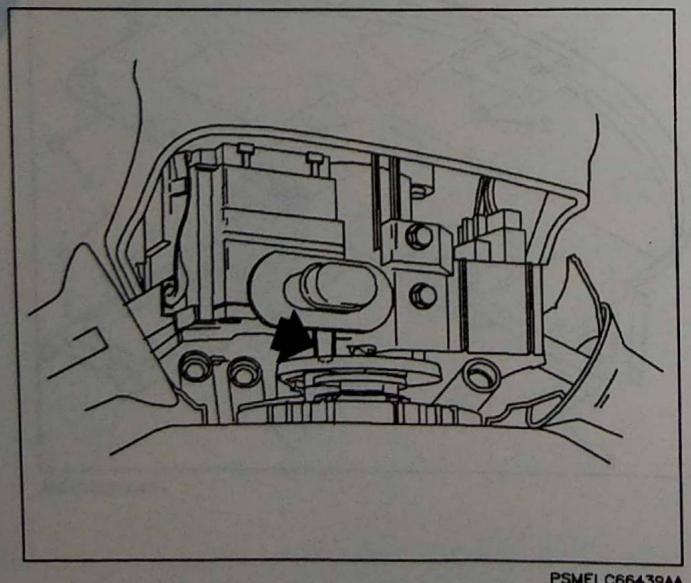
PSMV1S66047M

7. Connect side window demister tubes to floor outlets



PSMVIS66337AA

8. Install side door weatherstrip onto pinch weld flange near instrument panel.



PSMELC66439AA

9. Connect connector to windshield washer switch.
10. Install screws retaining switch.

Torque: 2.5 N*m (22 in—lbs)

11. Connect connectors to turn signal, headlamp, and cruise switch.
12. Place switch in position, being careful that the pin is positioned correctly against the ring on the back of the turn signal cancel cam assembly.
13. Install screws retaining switch.

Torque: 2.5 N*m (22 in-lbs)

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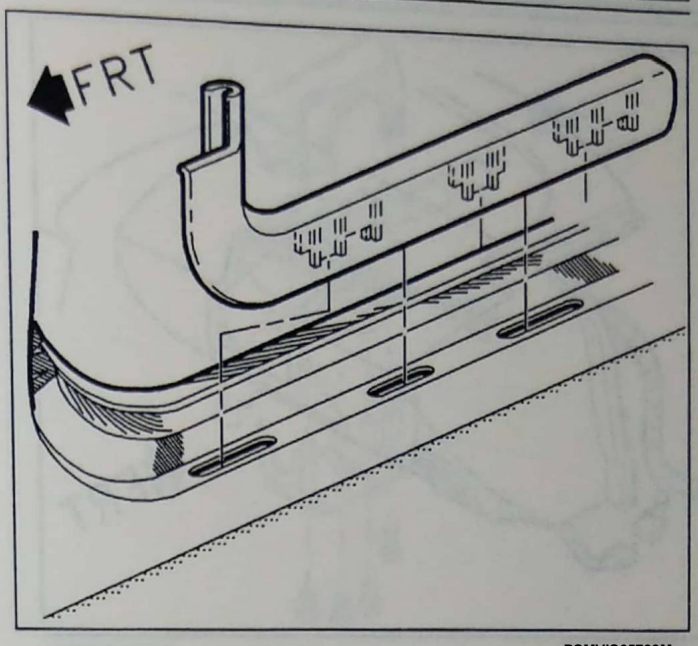
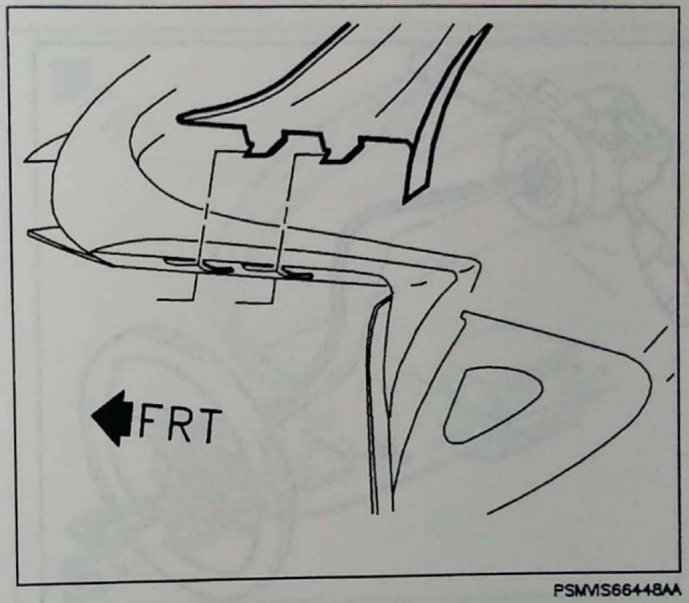
14. *Locate carpet* retainer to door opening,
15. firmly seat carpet retainer into weather.
16. Snap cl'Ps into slots in inner rocker pan.



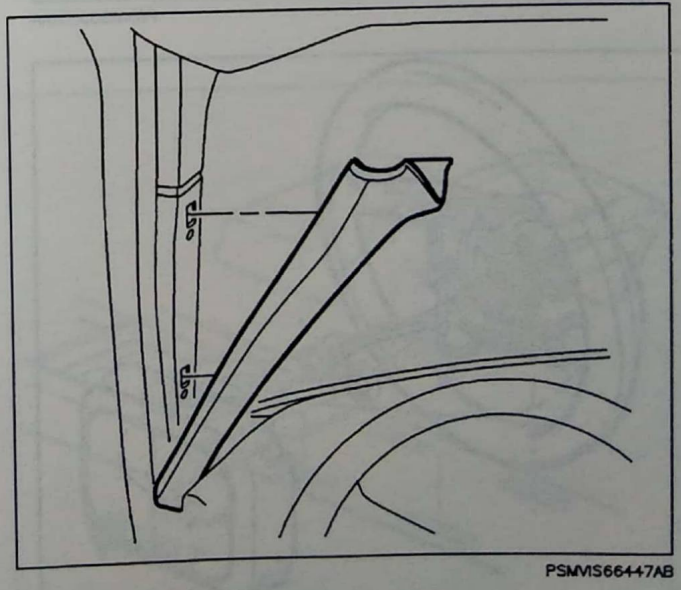
PSMVIS65733M

17. Insert tabs on bottom of garnish molding into instrument panel.
18. Push molding downward and forward past A-pillar structure.



PSMVIS66448AA

19. Push molding to structure pressing forward and outward to insure proper fit to instrument pan , el headlining and door seal.
20. Align clips on garnish molding to slots in A pillar and press firmly at clip locations.
21. Position flap on door weatherstrip over windshield garnish molding.



PSMVIS66447AB

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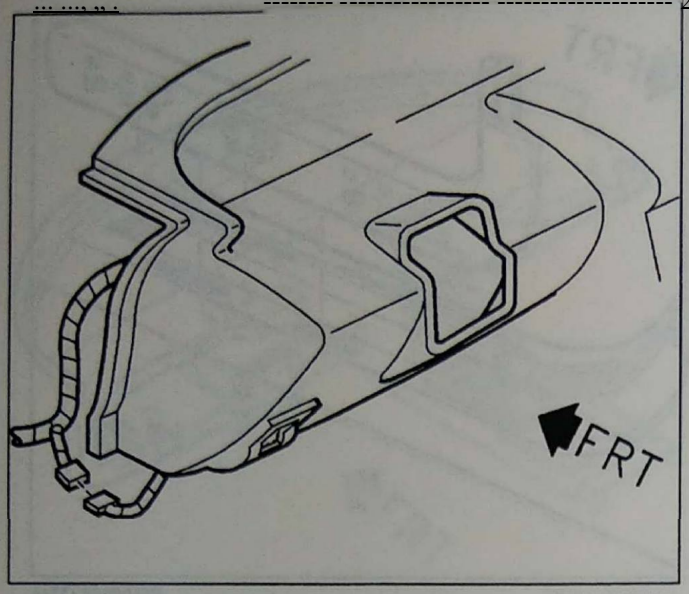
22. Connect park brake switch connector.



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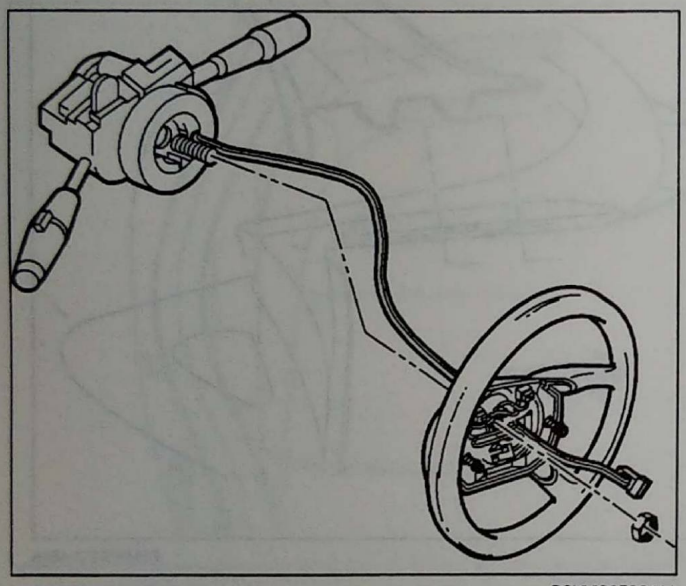
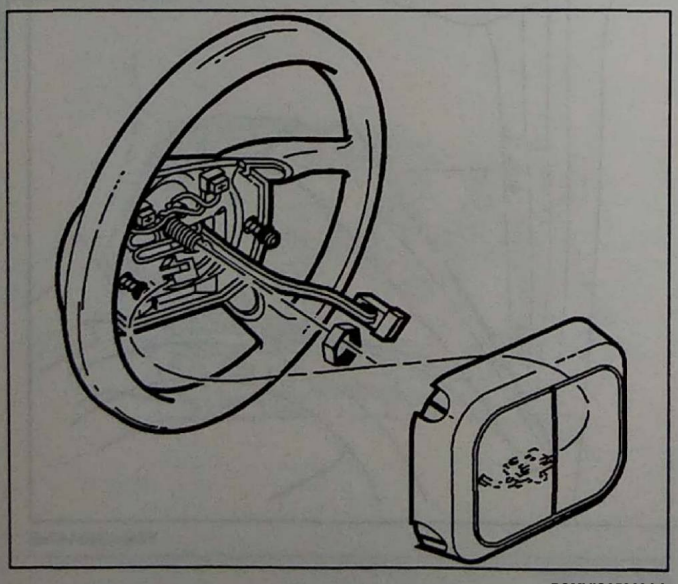


PSMVIS65864AA

23. Route SIR cable through steering wheel. Install steering wheel to column.
24. Connect horn wire connector.
25. Install steering wheel nut.

Torque: 42 N*m (31 ft—lbs)



PSMVIS65863AA

26. Route yellow SIR inflator module wire harness within the steering wheel hub forming an “S” shape with wire and connect SIR inflator module connector.
27. Install CPA, to connector.
28. Install inflator module to steering wheel.

Torque: 10 N*m (89 in-lbs)

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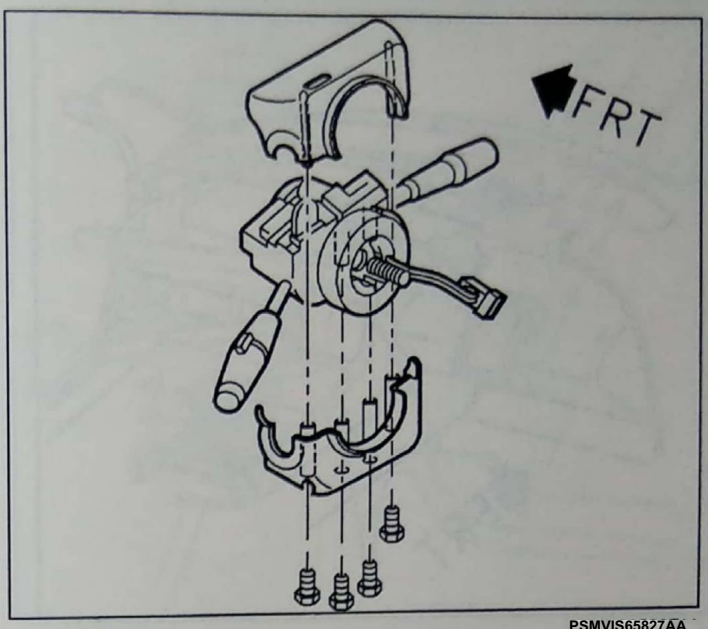
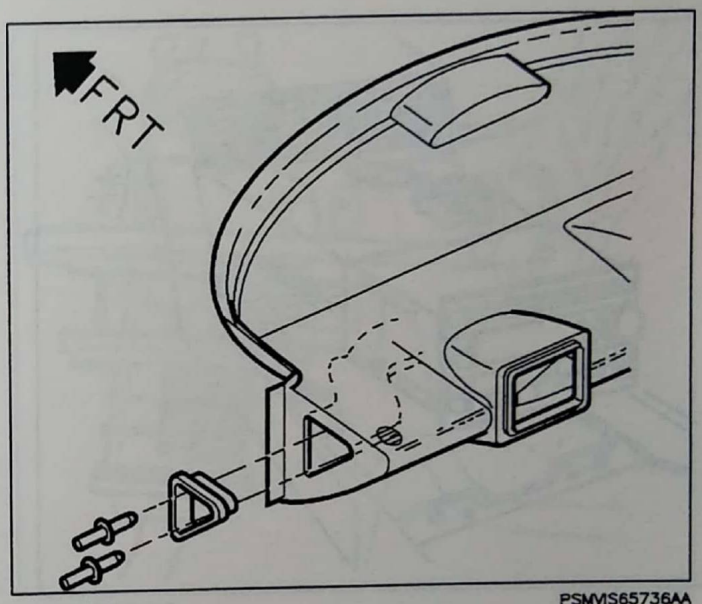
cteering column trim cover to steering
A^0 ^stall and tighten inner screws.

' C°|Uinn steering column trim panel to steering
tn A'*n UPPnd install outer screws in lower steering
c0,unin nm panel. Tighten outer screws,
column trim t



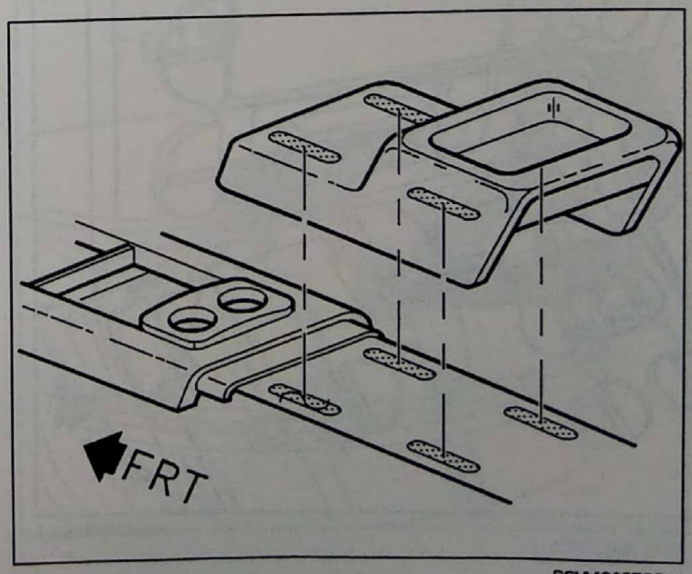
PSMVIS65827AA

31 Install left and right front side door air outlets on side of the instrument panel using new fasteners.



PSMVIS65736AA

32. Install arm rest



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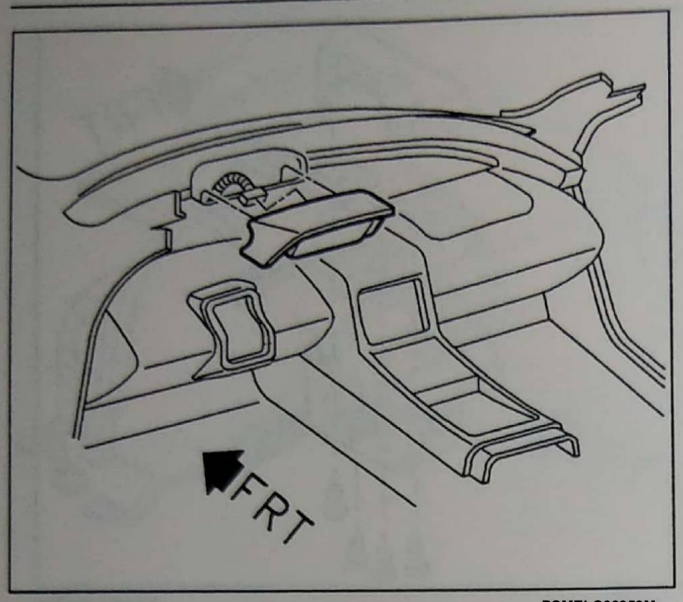
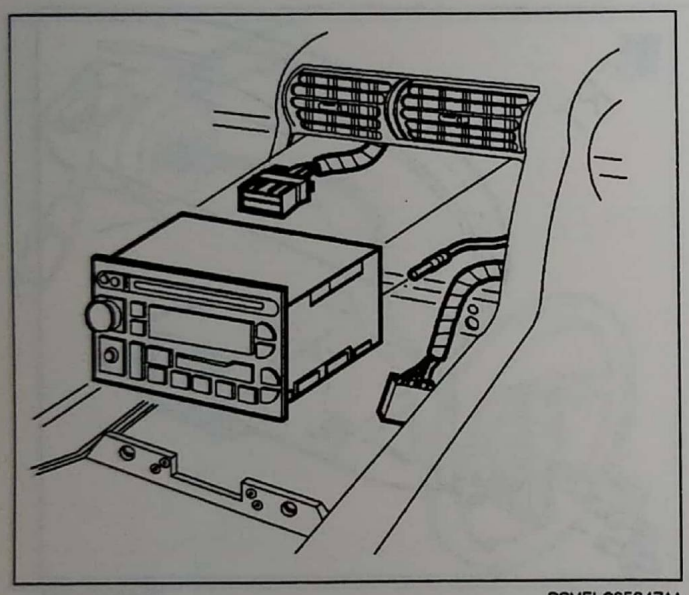


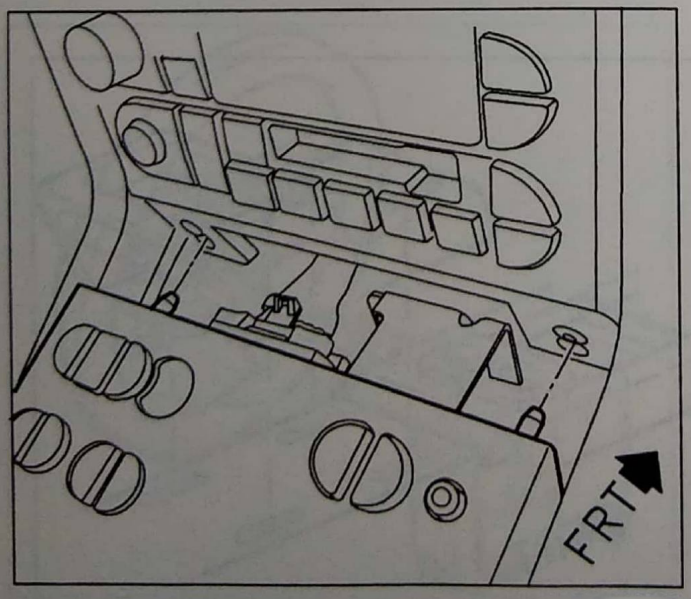
PSMELC66359M

33. Push harness connector into socket on instrument panel cluster. Verify connection is made, seated and locked.
34. Install instrument panel cluster into instrument panel by pushing forward and downward.



PSMELC65847AA

35. Connect radio harness to radio, then antenna lead to radio. Verify both connections are seated properly.
36. Make sure antenna and harness are up and out of the way of the radio bracket. Slide radio into opening until the radio is seated and the radio fits tightly to the console. You may hear a click as the radio tab locks into the bracket.



PSMELC66360M

37. Cover the radio face with a rag for protection during RSA installation. Install shift cable housing into shift bracket and connect and secure shift cable to shifter. Be sure clip lock tab is in place.
38. Connect wire harness connector to RSA.
39. Align RSA locator tabs to front of instrument panel and push down on the rear of the RSA.
40. Install TORX™ fasteners.

Torque: 6N*m (53 in-lbs)

IMPORTANT: You must adjust shift cable at final drive unit.

41. Adjust shift cable:

IMPORTANT: The shift cable must be attached to the RSA with the RSA secured in position. Shift handle must be placed in neutral before cable adjustment is performed.

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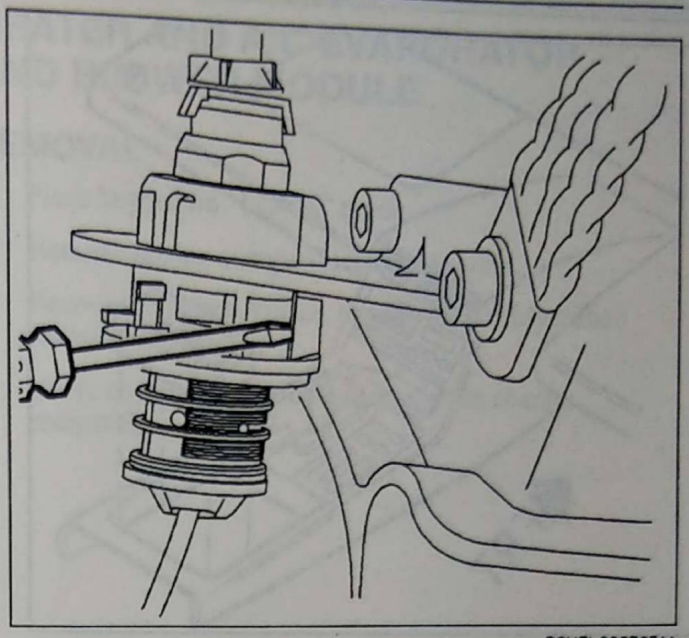
underbody front air deflector assembly.

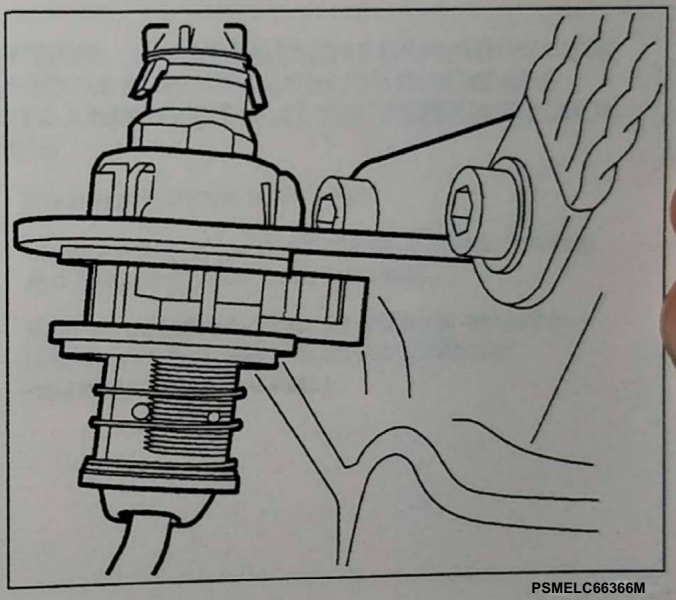
a. Hfcr to "Underbody Front Air Deflector Jsembly" in this manual.)

b. lock U-shaped adjustment collar. Collar is Heated aft of drive unit bracket, and will unlock bv inserting a pocket screwdriver into gap and prying towards drive unit.



PSMELC66365AA

I>fl>ORTANT: About 13 mm (1/2 in.) movement necessary to insure unlock position.



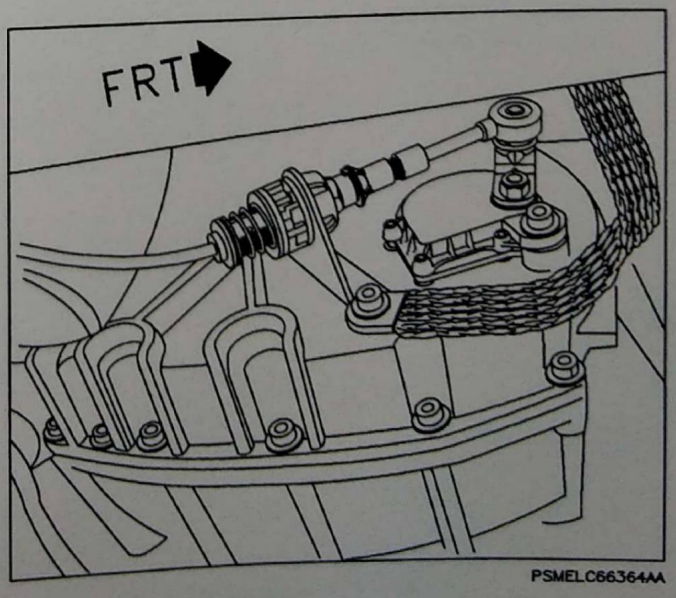
PSMELC66366M

c. Verify shift lever is in neutral. Push U-shaped collar into lock position. Collar will move to right side of vehicle.

d- By hand shift park/lock lever to the full counterclockwise position (DRIVE) then move one detent in the clockwise direction (NEUTRAL).

e Install underbody front air deflector assembly. (Refer to "Underbody Front Air Deflector Assembly" in this manual.)

^°TICE: If shift cable has been removed more than rpLi mes a* eRher end, for any reason, the cable must e b rePlaced.



PSMELC66364AA

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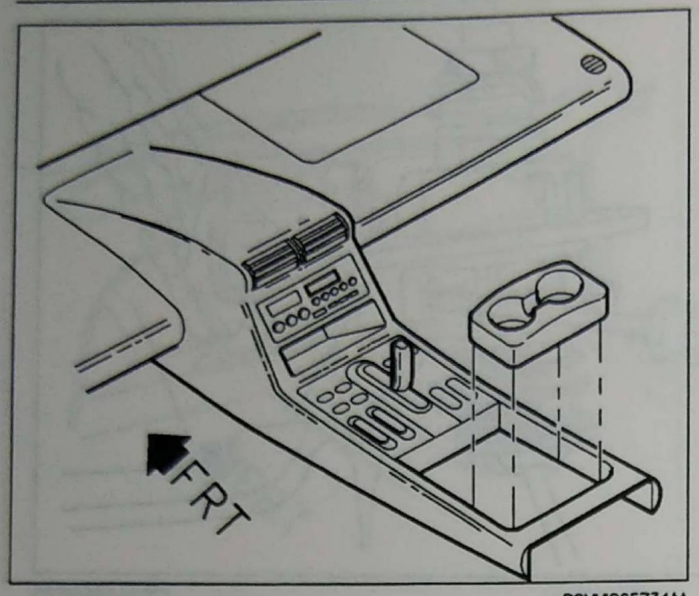

PSMVIS65734AA

42. Install cup holder to center console.
43. Enable the SIR system. (Refer to "Enabling the SIR System" in this manual.)

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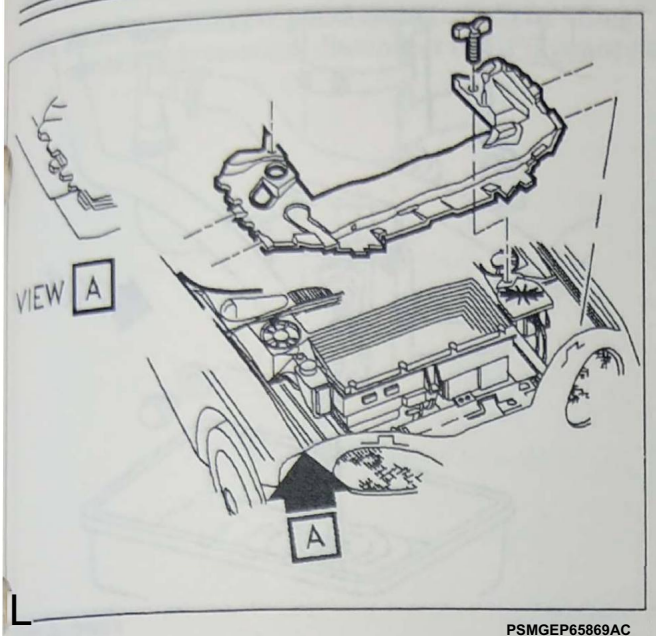
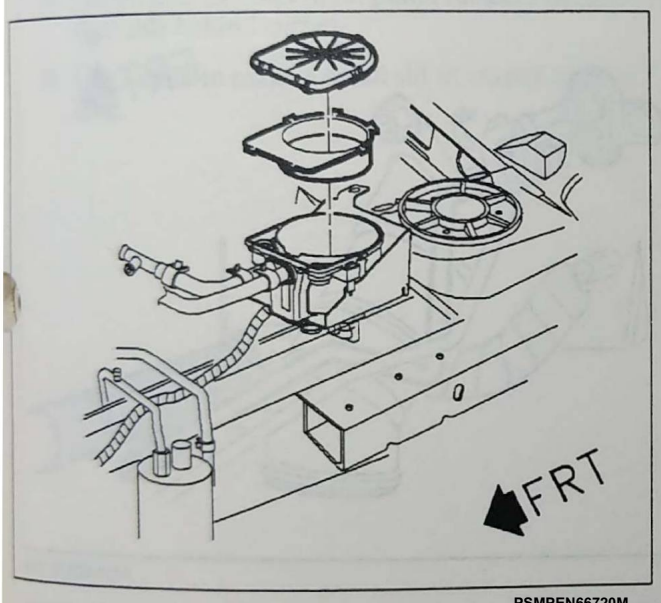


PSMGEP65869AC

HEATER AND A/C EVAPORATOR AND BLOWER MODULE

REMOVAL

1. Place keypad on "LOCK" mode.
2. Remove engine compartment sight shield.
3. Recover refrigerant using an approved refrigerant recovery system.
4. Verify charge coupler is not installed in charger receptacle.



PSMPEN66720M

CAUTION: DO NOT REMOVE EXPANSION TANK COVER OR OPEN COOLING SYSTEM DRAINS FROM A HOT SYSTEM. ALLOW SYSTEM TO COOL FIRST.

5. Remove expansion tank cover.
6. Raise vehicle on hoist. (Refer to "Lifting, Jacking, and Support Points" in this manual.)
7. Remove underbody front air deflector assembly. (Refer to "Underbody Front Air Deflector Assembly" in this manual.)

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8. Position drain pan under water pump manifold.

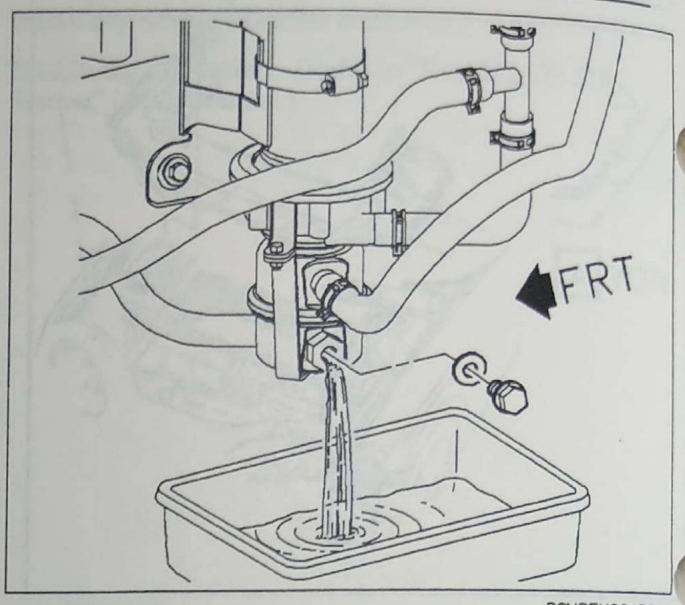
IMPORTANT: A two gallon container will be required to hold the coolant.

9. Remove drain plug and gasket from the water pump manifold allow coolant to flow from the main path.

10. After coolant has drained from the main path reinstall water pump manifold drain plug and gasket.

Torque: 11 N*m (97 in-lb)

11. Install underbody front air deflector assembly. (Refer to "Underbody Front Air Deflector Assembly" in this manual.)



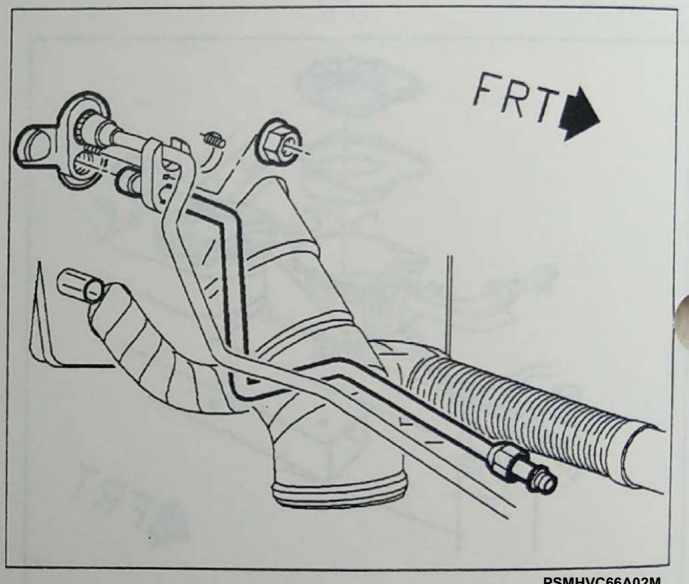
PSMPEN66458AB

12. Lower vehicle on hoist.

13. Remove nut retaining tube at front of dash.

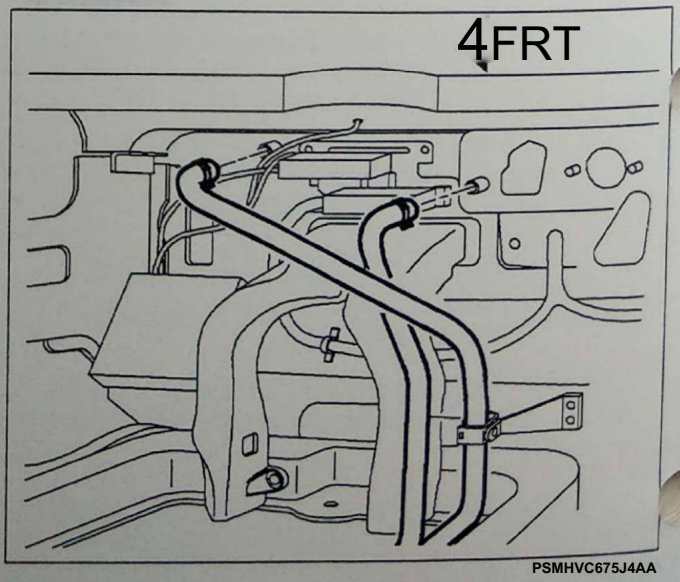
14. Disconnect evaporator tube from evaporator.

15. Disconnect condenser tube from evaporator.



PSMHVC66A02M

16. Disconnect heater core inlet and outlet hoses from heater core at front of dash.



PSMHVC675J4AA

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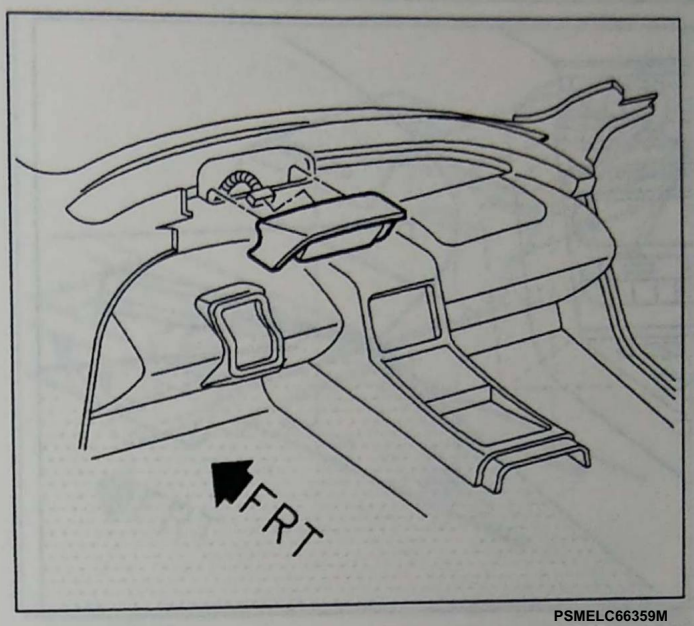
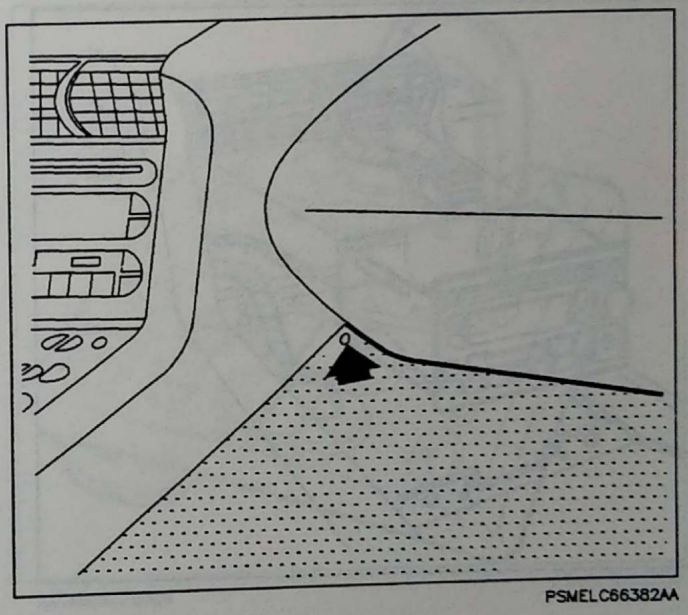
17. Remove instrument panel cluster (IPC) by lifting upward and rearward, disconnect the IPC connector.



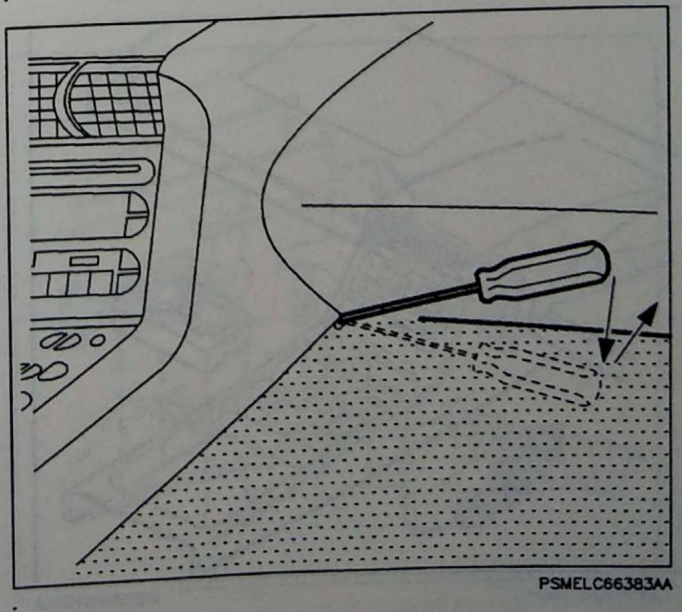
PSMELC66359M

18. Locate hole in instrument panel tunnel bracket on right side behind carpet.

19. Use a knife to make a small slit in carpet over the hole.


PSMELC66382AA

20. Insert a screwdriver with a blade about 152 mm (6 in.-12 in.) long into the hole in the instrument panel tunnel bracket. Slide screwdriver aiong instrument panel radio bracket until the screwdriver is wedged between bracket and the radio olck tab. The screwdriver should be inserted about 152 mm (6 in.).


PSMELC66383AA

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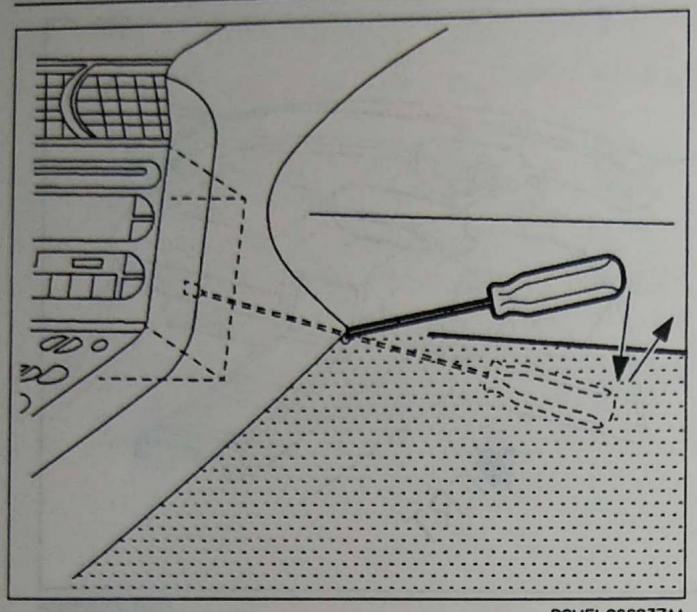
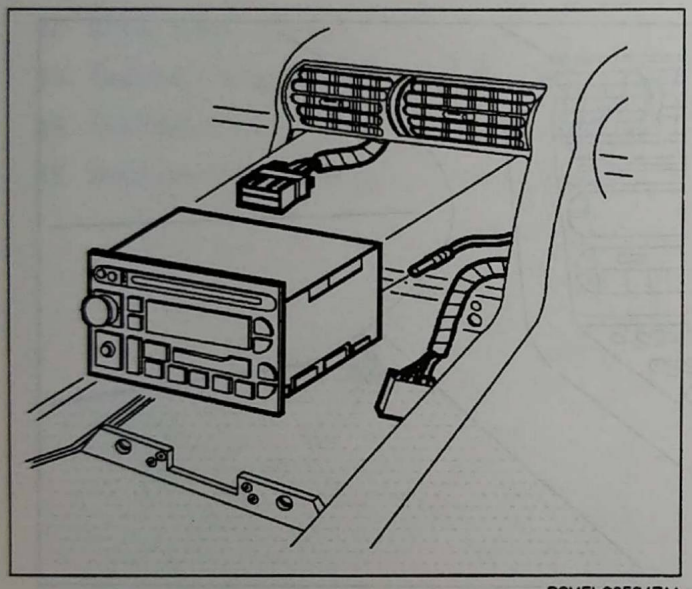


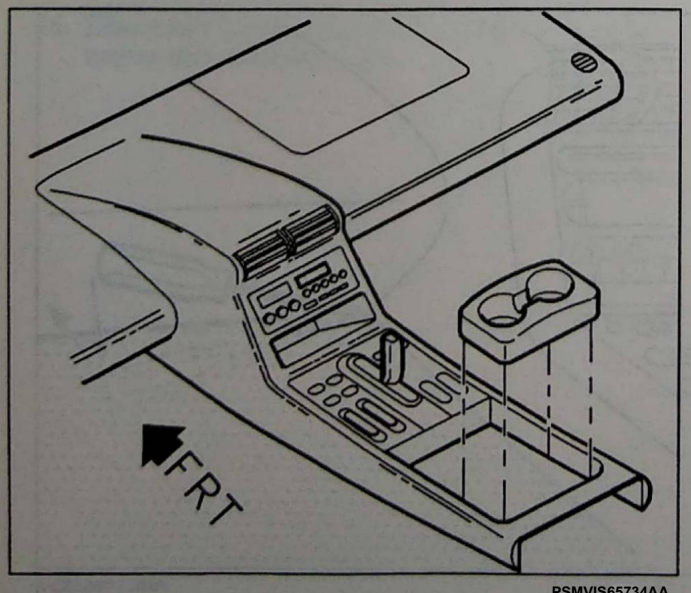
PSMELC66837AA

21. Push downward then forward on the screwdriver handle, lifting the lock tab upward and the radio rearward simultaneously. The radio should move rearward enough so that it can be pulled out the rest of the way by hand.
22. With the brake applied, shift run/lock shift assembly (RSA) to DRIVE, then select ACCY mode to shut Off power and apply the parking brake to keep the vehicle from rolling unexpectedly.
23. Lay a clean shop rag over the RSA to help protect it from getting scratched by the radio case during radio removal.
24. Slide radio out of instrument panel.



PSMELC65847AA

25. Disconnect the antenna lead first, then the harness connector.
26. With the brake applied, select the RUN mode again, and shift back to PARK. Then select the lock mode to turn the vehicle Off.



PSMVIS65734AA

27. Remove cup holder.

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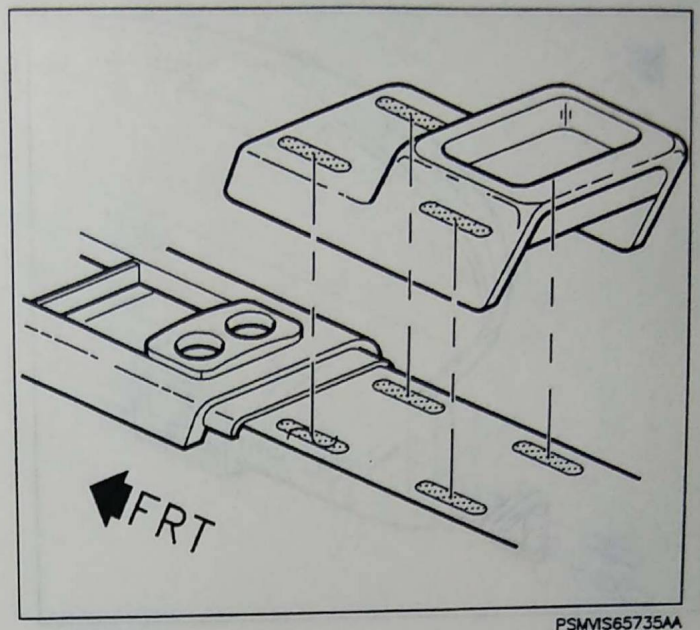
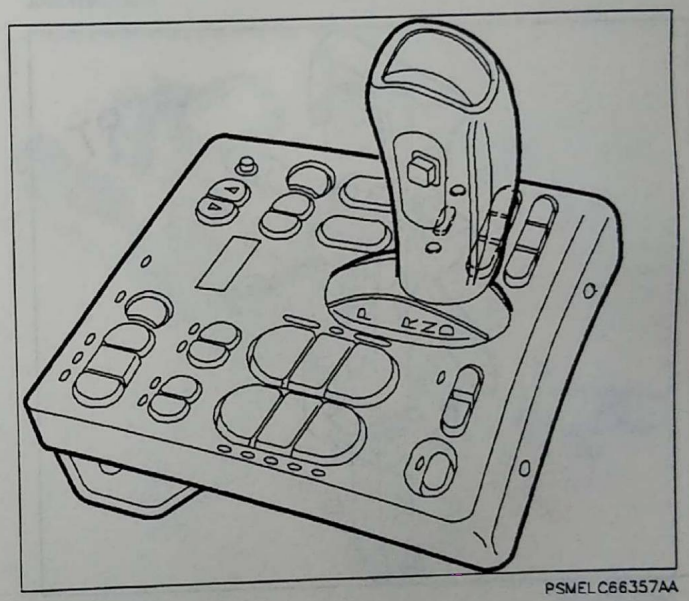
28. Remove arm rest from tunnel by lifting upward releasing Dual-Lock retainers.



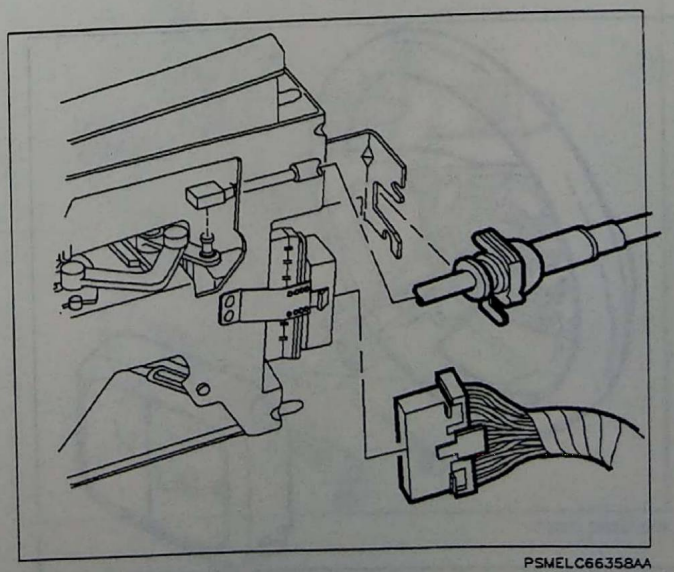
PSMMS65735AA

29. Remove the T—25 TORX™ screws in the rear of the RSA pull RSA rearward about 63 mm (2.5 in.).



PSMELC66357AA

30. Rotate RSA towards the drivers side of the vehicle to a 45 degree angle.
31. Disconnect the RSA wire harness connector.
32. Disconnect the shift cable from the shifter and remove shift cable from retainer bracket by prying locking tab on drivers side of RSA gently and pushing cable down out of bracket.



PSMELC66358AA

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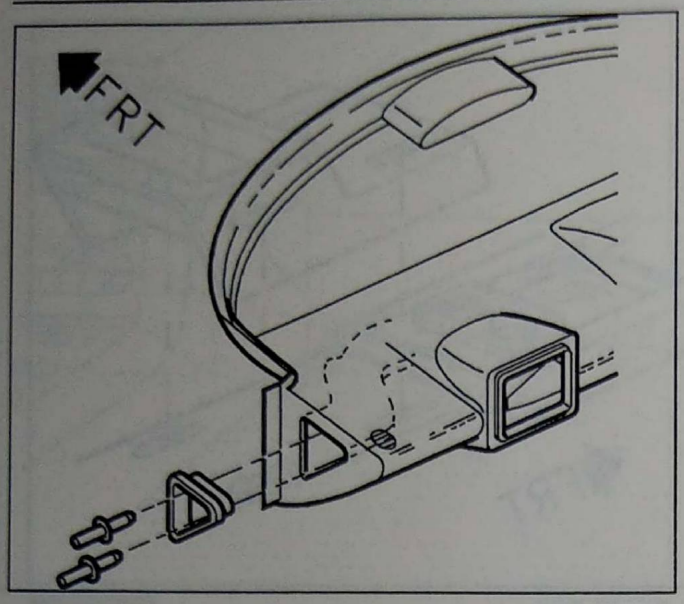
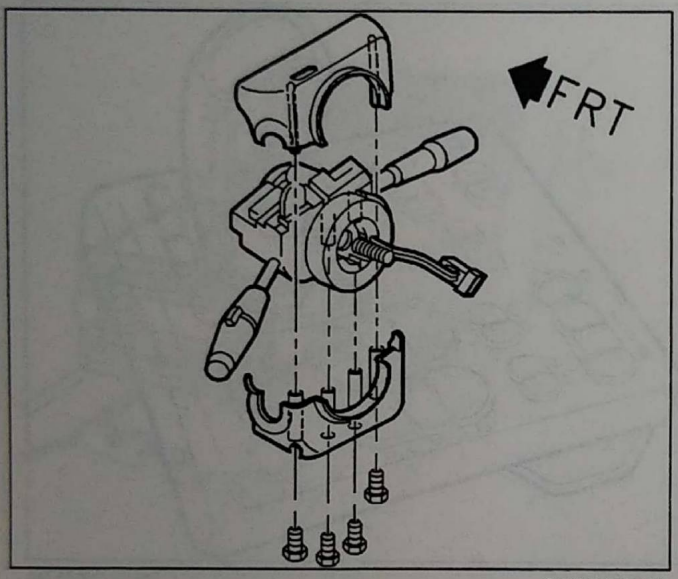


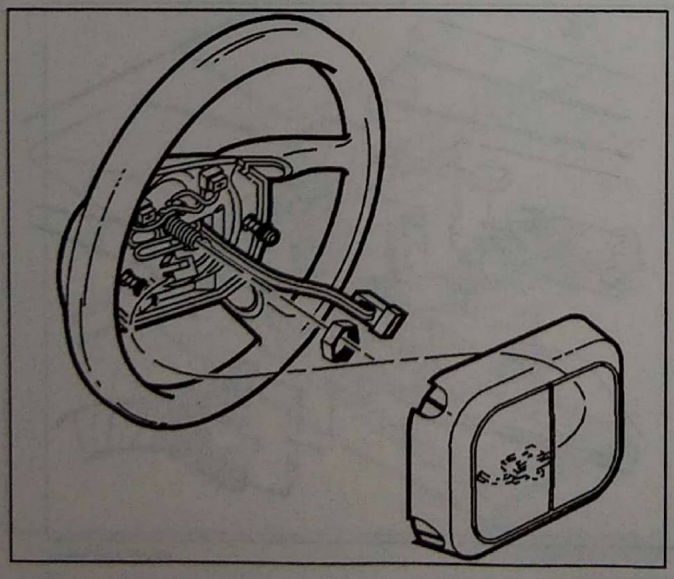
PSMV1S65736AA

33. Drill out rivets from side door air outlets.
34. Remove left and right front side door air outlets on the side of instrument panel with doors open.



PSMVIS65827AA

35. Remove outer screws from lower steering column trim cover, lift upper trim panel off.
36. Remove inner screws from lower steering column trim cover and remove lower trim cover.



PSMVIS65863AA

37. Remove screws from back of steering wheel that retains SIR inflator module.
38. Remove connector position assurance (CPA) and disconnect inflator module connector.
39. Remove SIR inflator module.

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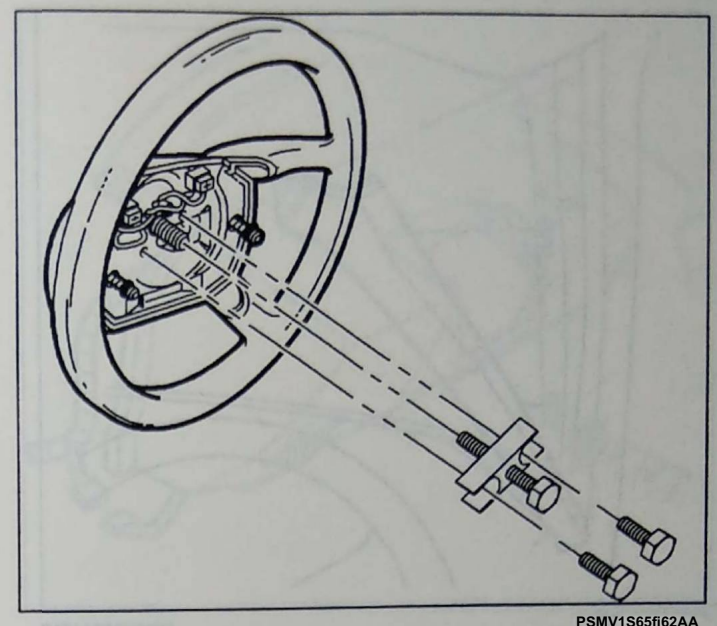
^Connect horn switch connector.

40. Dis

Remove nut from steering column that retains steering wheel.

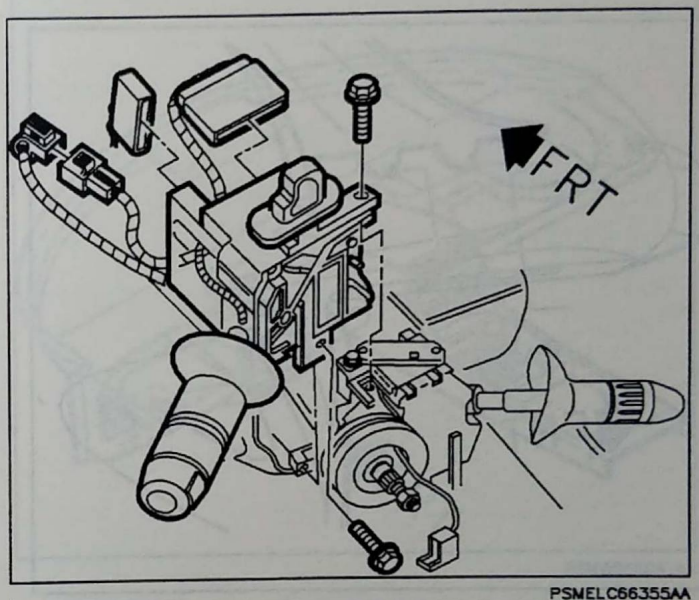
,, Install steering wheel puller SA9218NE and remove steering wheel.



PSMV1S65fi62AA

43. Remove T-25 TORX~/7mm screws from turn signal, headlamp, and cruise switch.

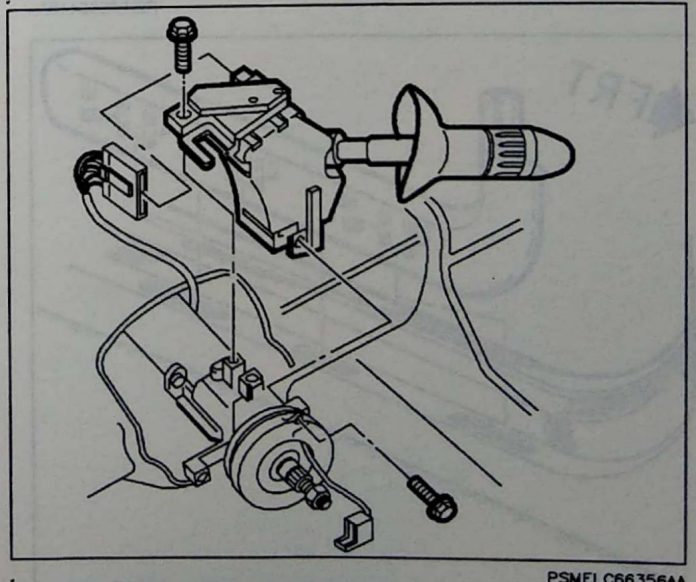
44. Remove switch and disconnect switch connectors.



PSMELC66355AA

45. Remove T-25 TORX" /7mm screws from windshield washer switch.

46. Disconnect connector and remove switch.



PSMELC66356AA

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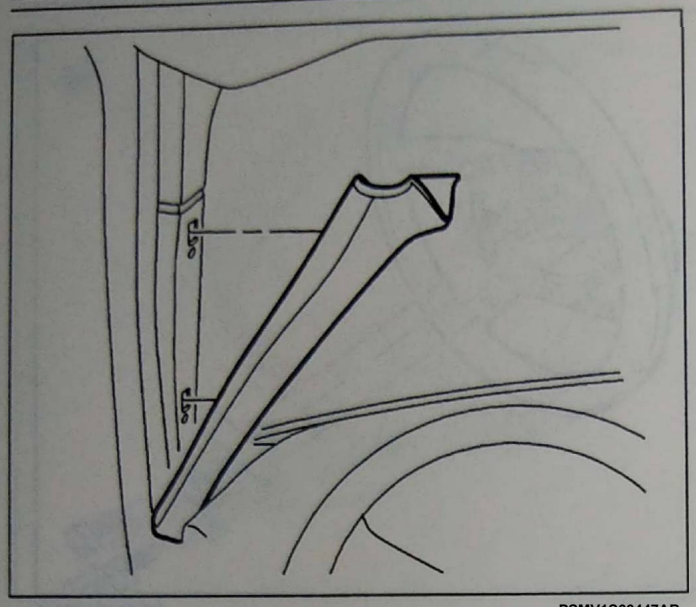
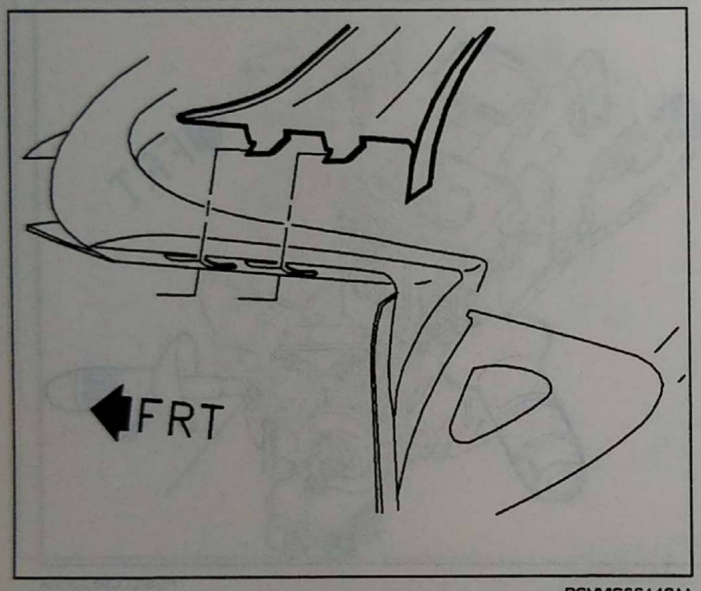


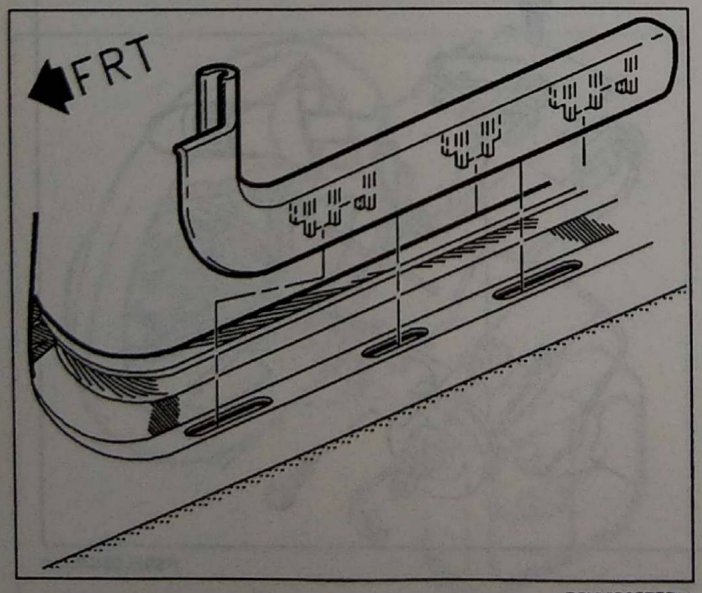
PSMV1S66447AB

47. Starting at top of garnish molding, pull firmly at clip locations to disengage. Tipping the top of molding inward with the bottom engaged to instrument.



PSMVIS66448AA

48. Disengage tabs on garnish molding from instrument panel by pulling rearward and inboard.



PSMVIS65733AA

49. Starting at rear of carpet retainer, pull firmly on carpet retainer at clip locations to disengage clips.
50. Remove front side door opening floor carpet retainer.

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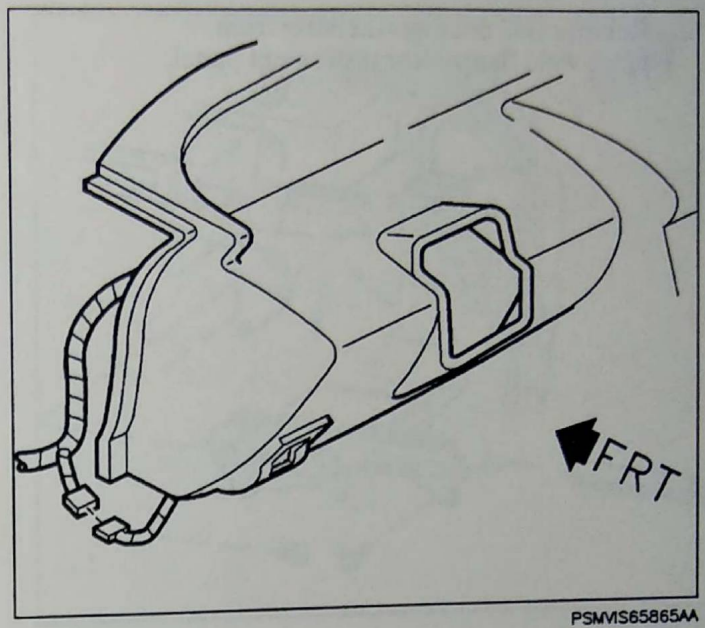
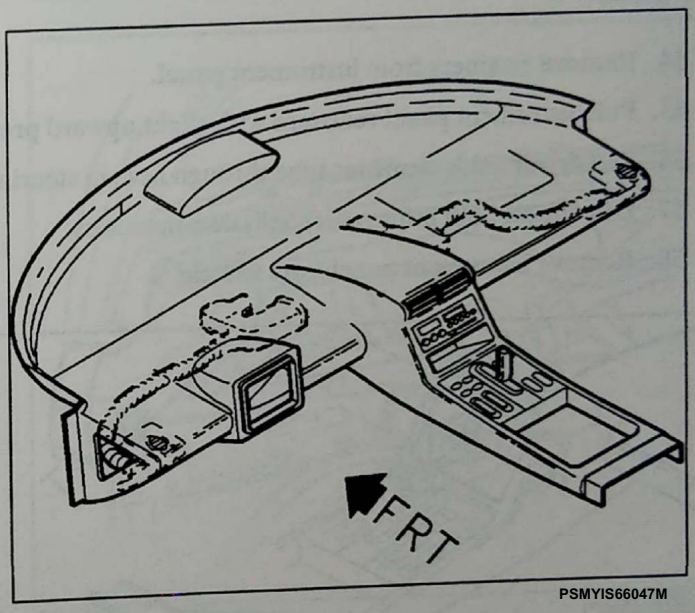
51. Disconnect parking brake switch connector.



PSMMS65865AA

52 Disconnect side window demistor tubes from floor outlets.



PSMYIS66047M

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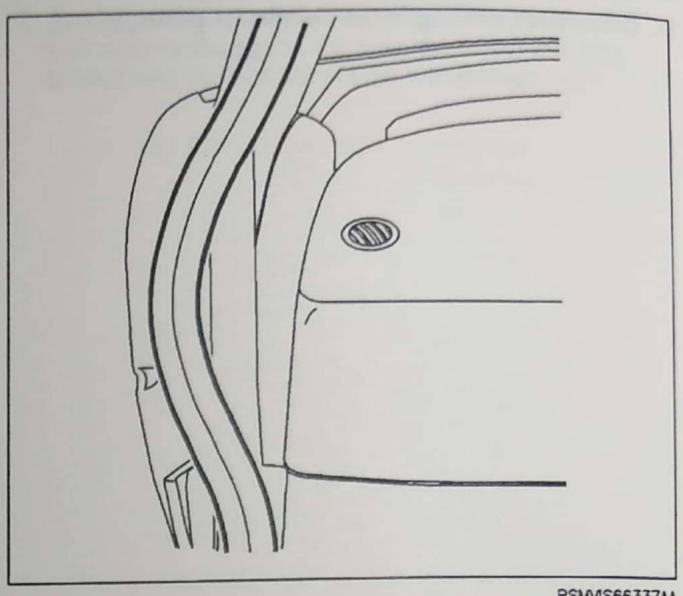
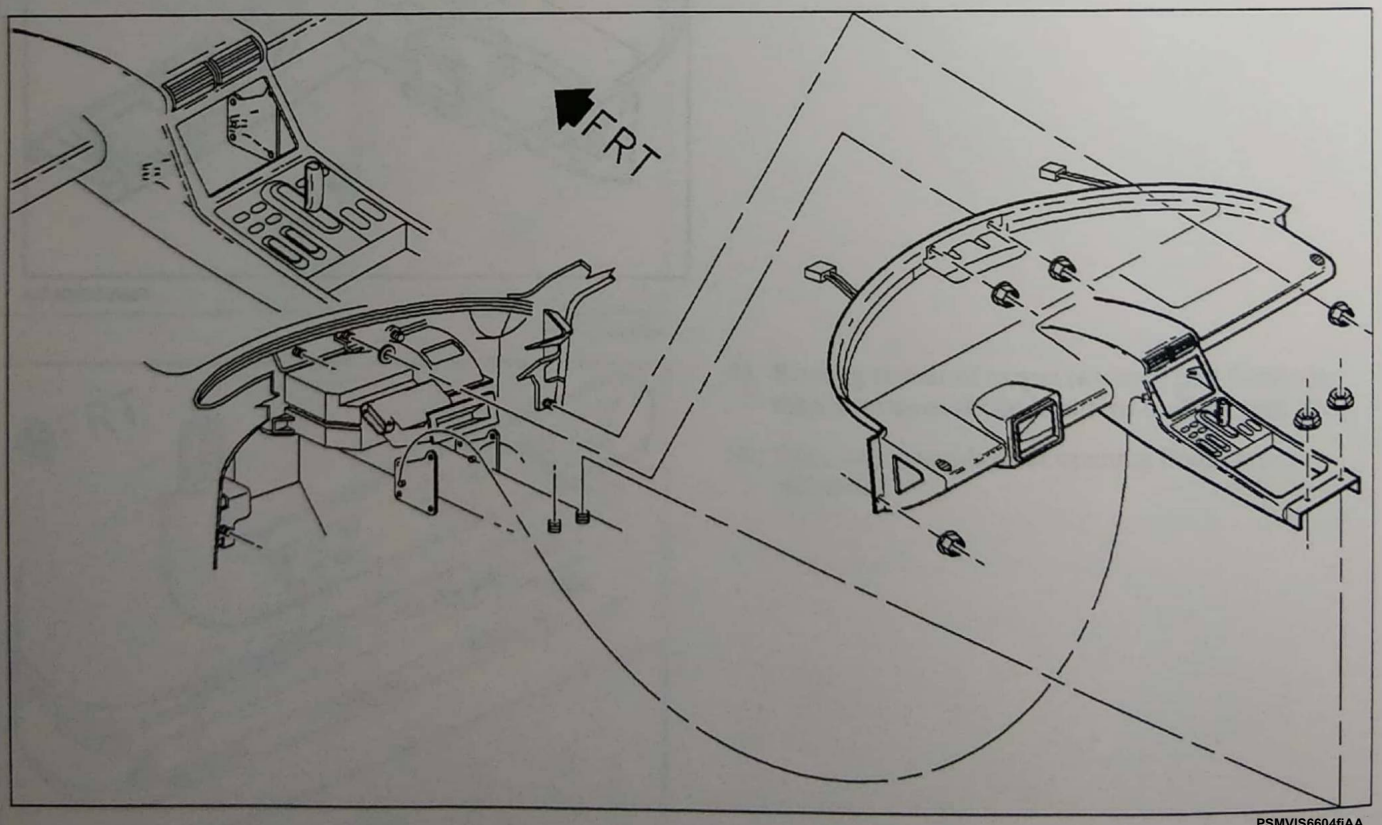
53. Remove side door weatherstrip from pinch weld flange near instrument panel.



PSMVIS66337AA

54. Remove retainers from instrument panel.
55. Pull instrument panel rearward with slight upward pressure.
56. Pull driver's side demister tube through hole in steering column support
57. Disconnect both information telltale connectors.
58. Remove instrument panel from vehicle.



PSMVIS6604fiAA

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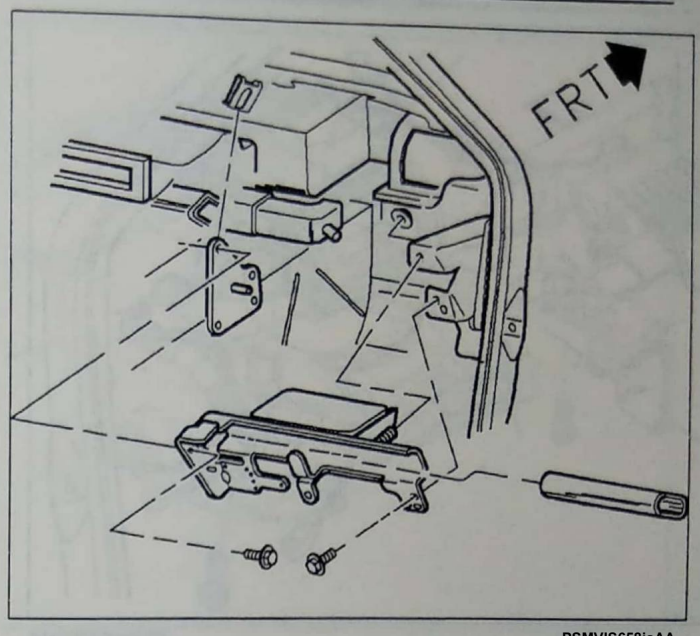
Remove passenger side HVAC cross car duct

59- *Disconnect cross car wiring harness rose* buds frn
60. instrument panel knee bolster reinforcement.

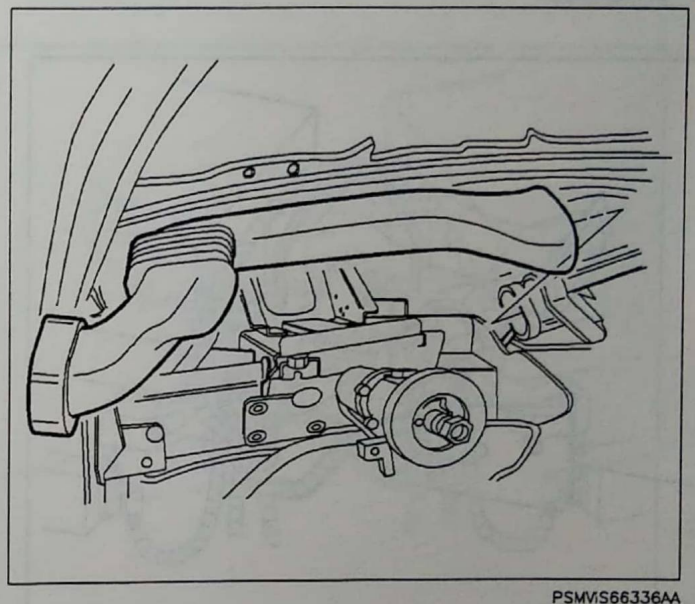
Remove bolts and nuts from instrument panel
61- bolster reinforcement. H Knee

62. Remove instrument panel knee bolster reinforcement from vehicle.



PSMVIS658iaAA

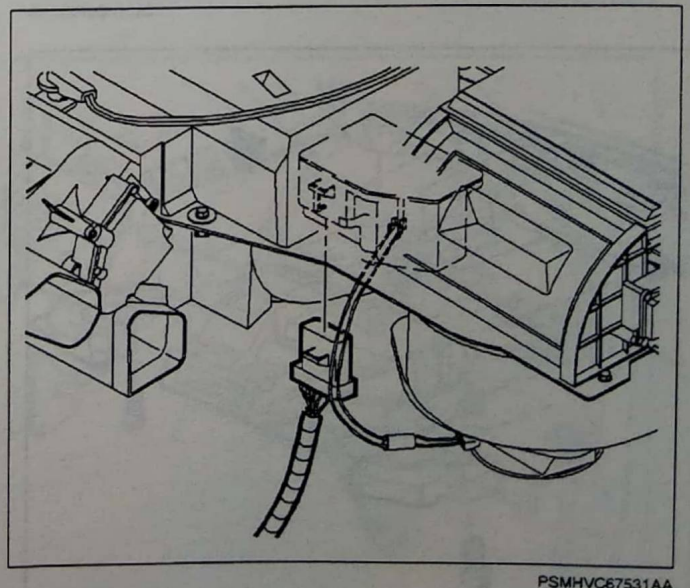
63. Remove drivers side outer air duct.



PSMVIS66336AA

64. Disconnect blower motor pulse width modulation control module connector.

*



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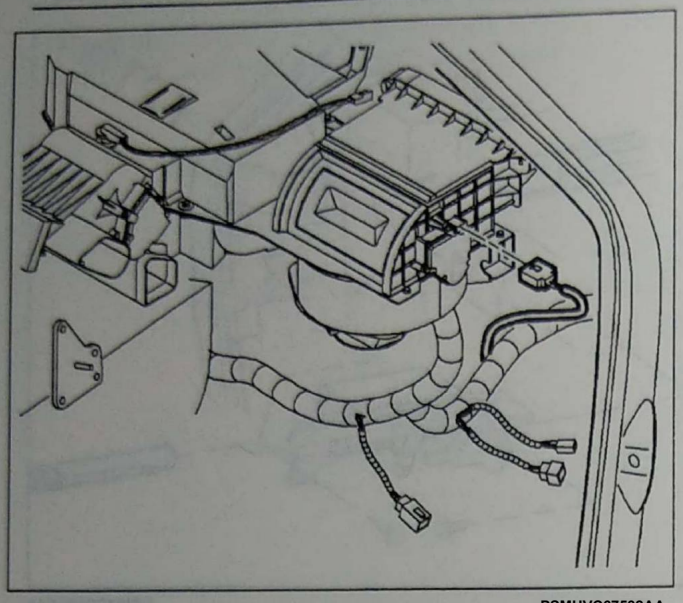
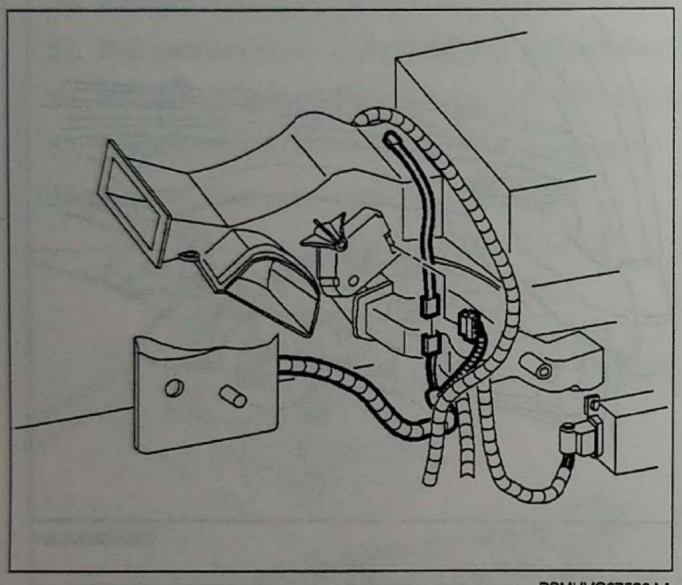


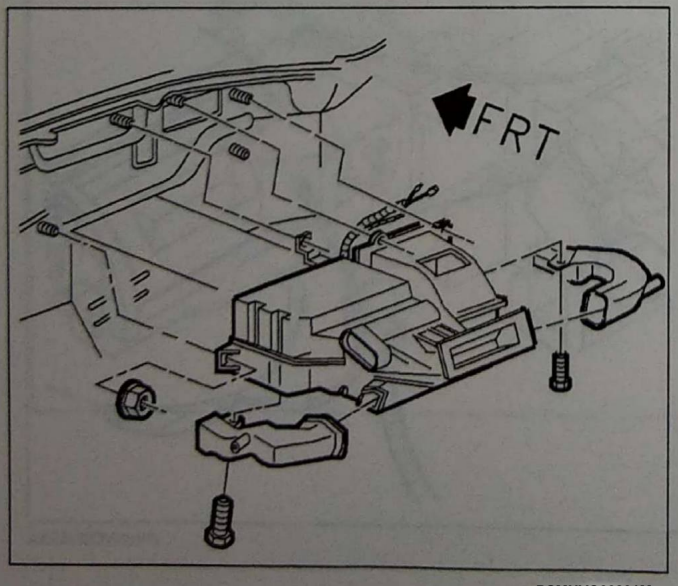
PSMHVC67532AA

65. Disconnect outside air valve actuator connector.
66. Remove wire harness rose bud retainers from heating and A/C module.



PSMHVC67533AA

67. Disconnect mode valve actuator connector.
68. Disconnect air temperature sensor connector.



PSMHVC66801M

69. Remove floor duct screws from heating and A/C module.
70. Remove floor duct from heating and A/C module.
71. Remove nuts retaining heating and A/C module at front of dash.
72. Remove heating and A/C module from vehicle while holding wire harness off of module when removing.

CamScanner

INSTALLATION

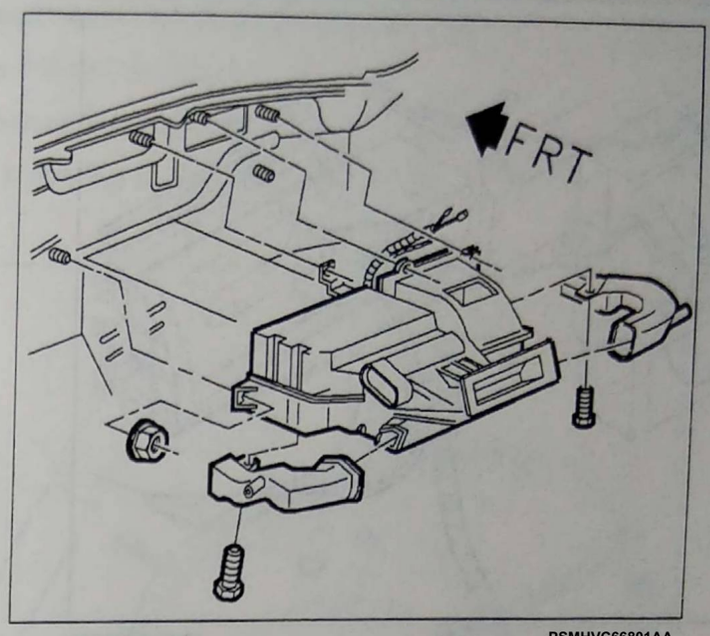
A/C module into vehicle over ar front of dash.

poutc cross car wire harness over the top of the module.

3. nstall module onto studs on front of dash and tighten.

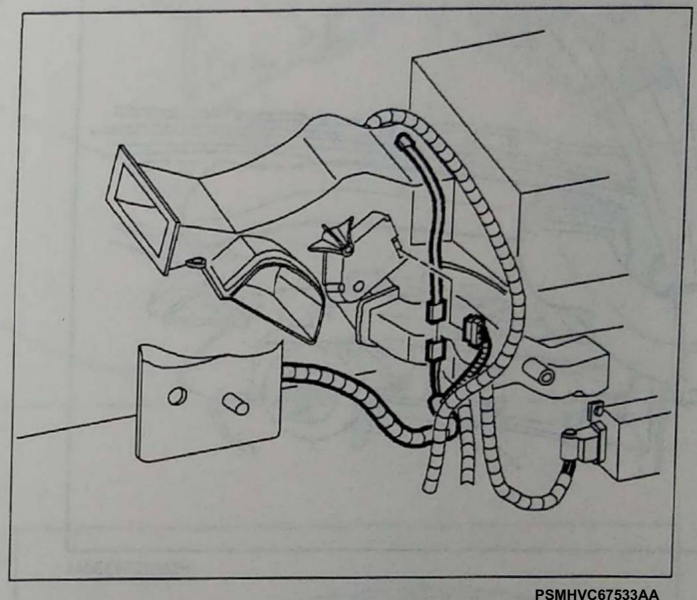
Torque: 4 N«m (36 in-lbs)

4. Install floor ducts onto heating and A/C module.



PSMHVC66801AA

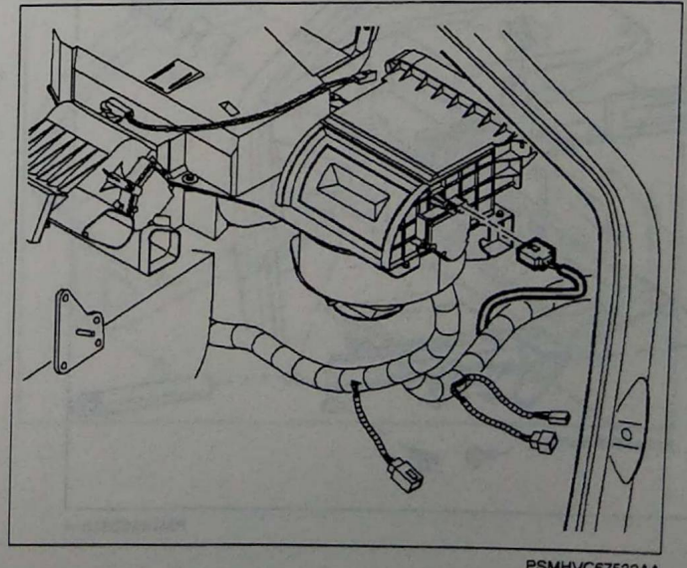
5. Install floor duct screws into heating and A/C module. Hand tighten.
6. Connect mode valve actuator connector.
7. Connect air temperature sensor connector.



PSMHVC67533AA

o- Connect outside air valve actuator connector.

9- Install wire harness rose bud retainers to heating and A/C module.



PSMHVC67532AA

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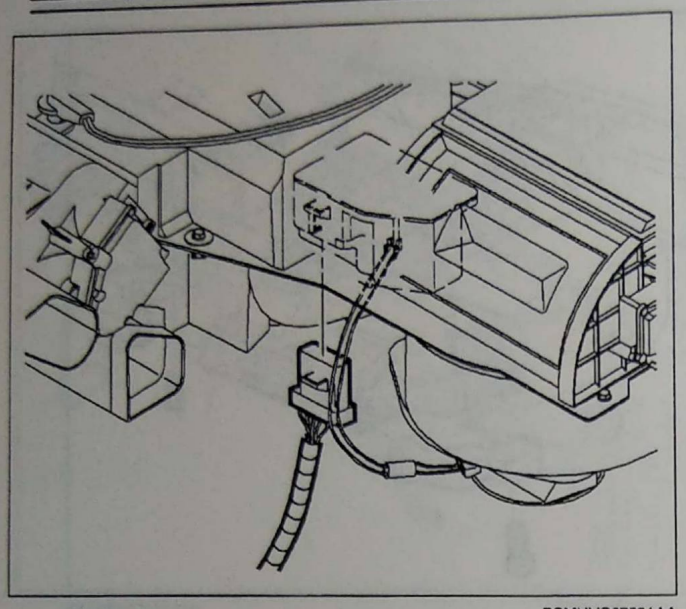
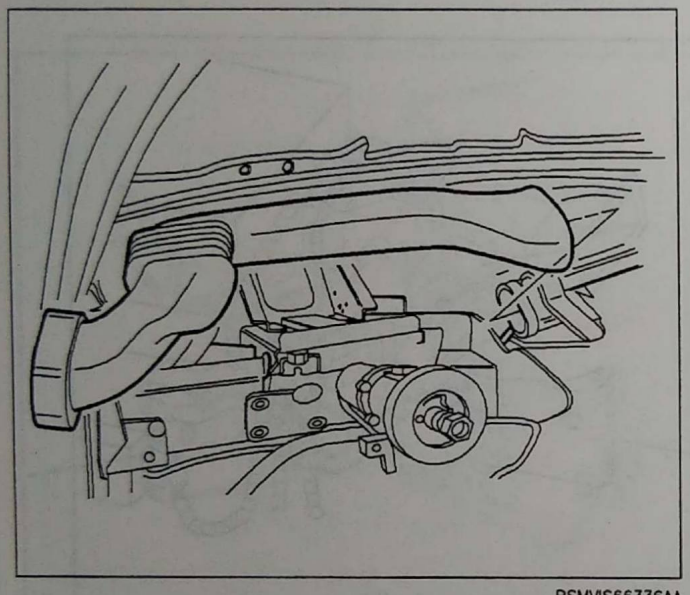


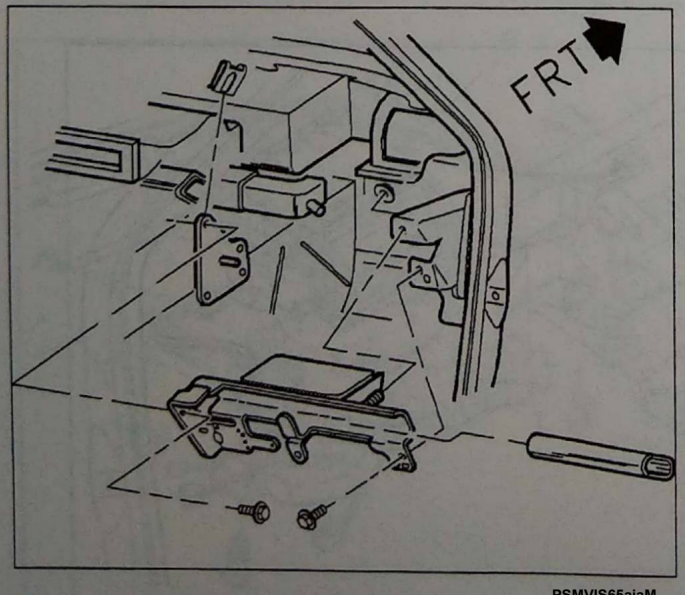
PSMHVC67531AA

10. Connect blower motor pulse width modulation control module connector.



PSMVIS66336AA

11. Install drivers side outer air duct.



PSMVIS65aiaM

12. Install instrument panel bolster reinforcement to space frame. Install bolts and nut. Torque in sequence.

Torque: 33 N»m (24 ft-lb)

13. Install passenger side cross car duct into bolster reinforcement and seat into heating and A/C module.

14. Insert cross car wire harness rose buds into instrument panel knee bolster reinforcement.

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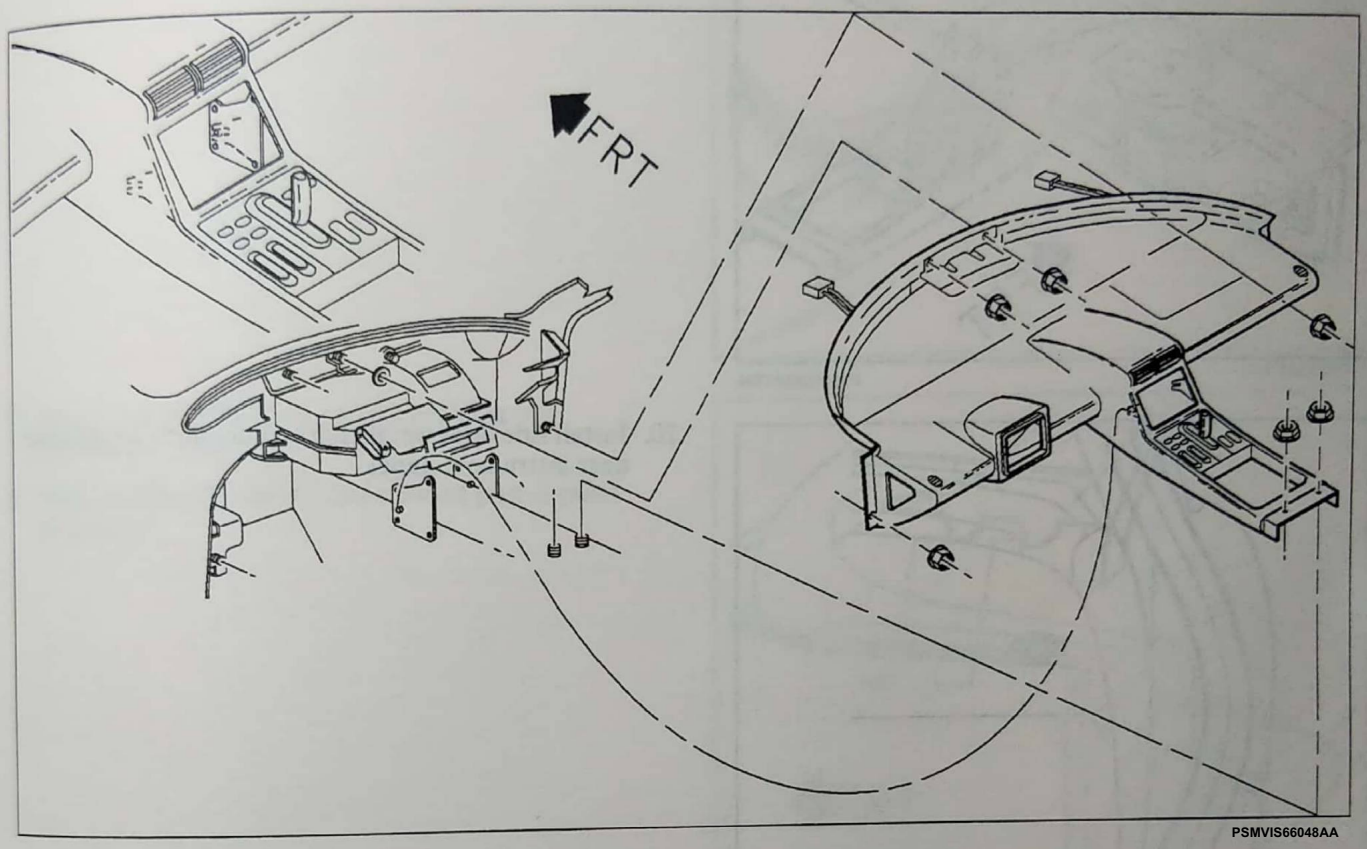
IMPORTANT: • Before assembling make sure spacer is in proper location to body. Refer to illustration.

I nstrument panel in location and connect information telltale connectors.

15. - jj je driver's side demister tube into and through hole in steering column support.

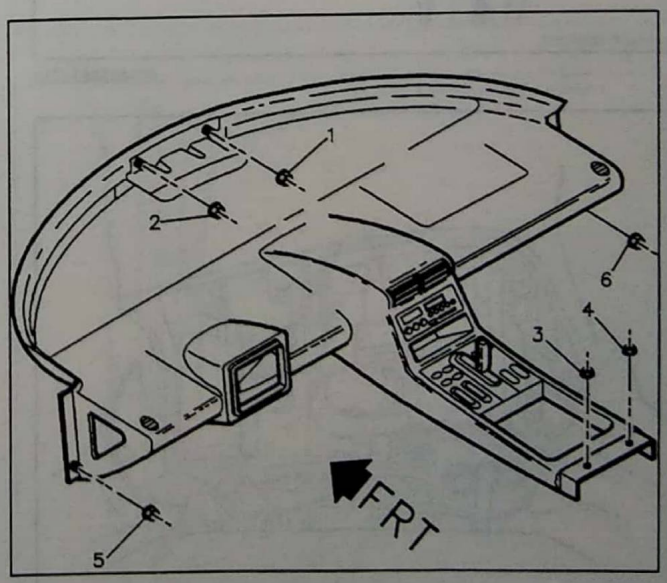
17. 11 instrument panel over studs on front of dash. The tunnel has locator pins on either side of which the instrument panel has to be located on when installing.



PSMVIS66048AA

18. Secure instrument panel fasteners.
Torque in sequence shown.

Torque: 5 N*m (44 in—lbs)



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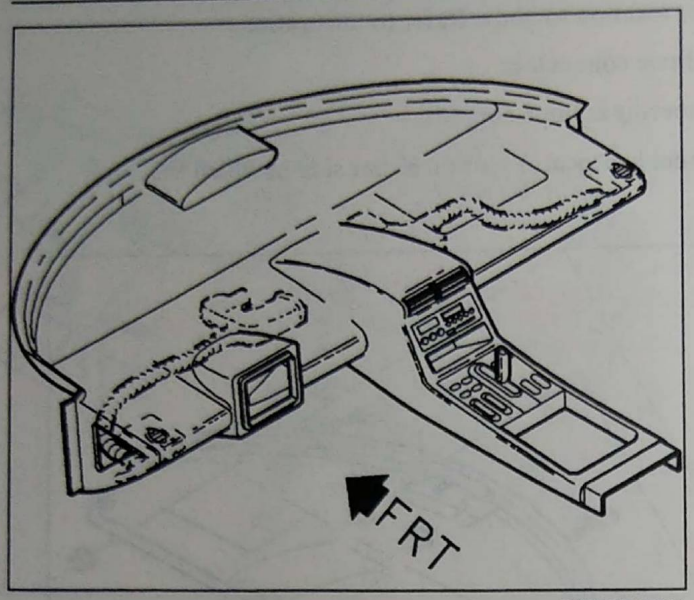
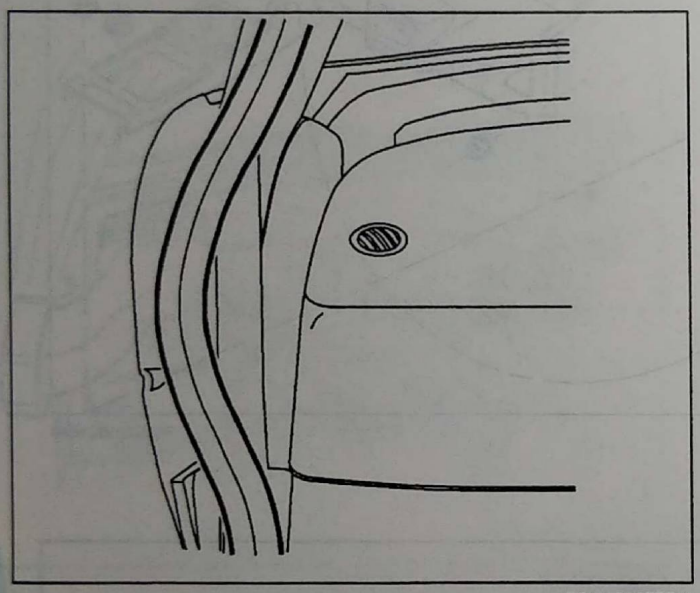


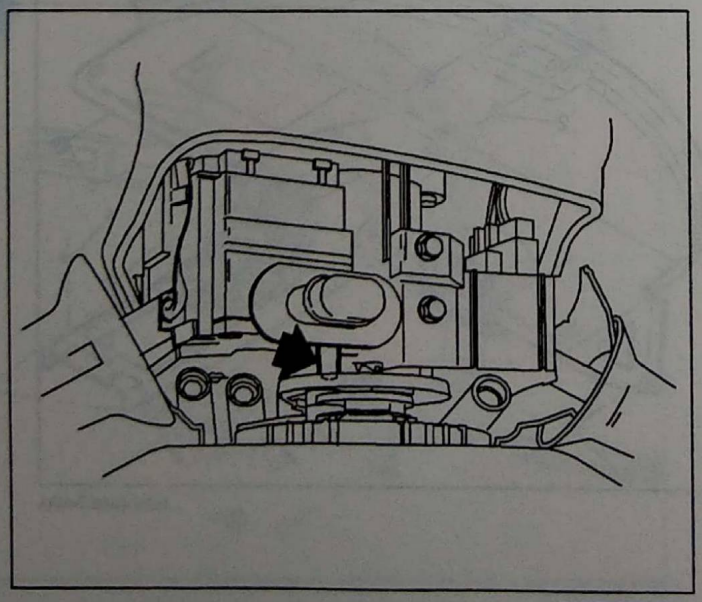
PSMVIS66047AA

19. Connect side window demister tubes to floor outlets.



PSMVIS66337AA

20. Install side door weatherstrip onto pinch weld flange near instrument panel.



PSMELC66439AA

21. Connect connector to windshield washer switch.
22. Install screws retaining switch.

Torque: 2.5 N*m (22 in—lbs)

23. Connect connectors to turn signal, headlamp, and cruise switch.
24. Place switch in position, being careful that the pin is positioned correctly against the ring on the back of the turn signal cancel cam assembly.
25. Install screws retaining switch.

Torque: 2.5 N*m (22 in—lbs)

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Locate carpet retainer to door opening.

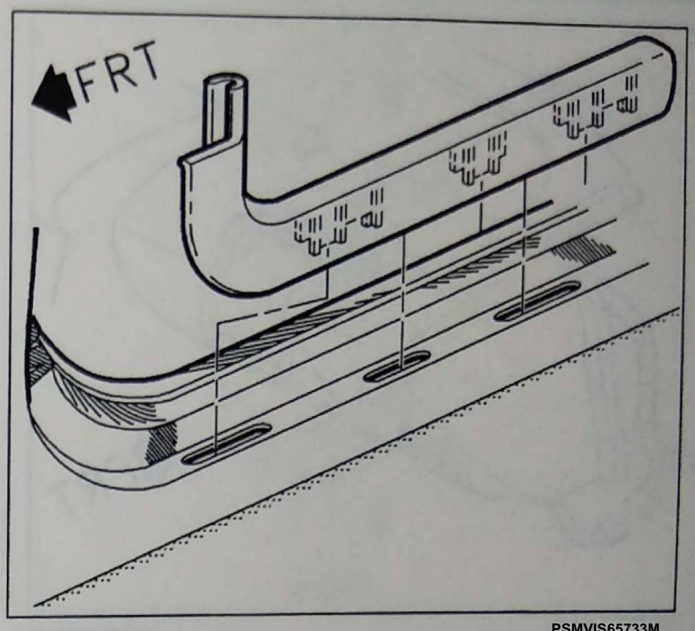
26.

Firmly seat carpet retainer into weather.

27.

Snap clips into slots in inner rocker pan.

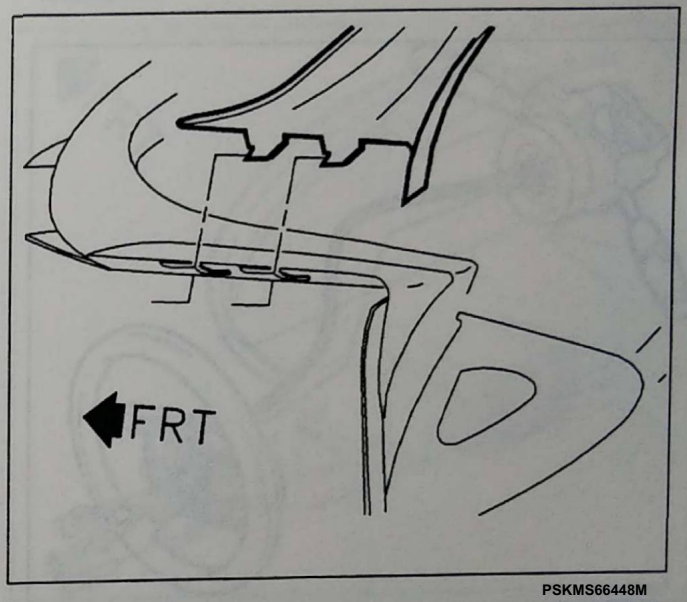
28.



PSMVIS65733M

29. Insert tabs on bottom of garnish molding into instrument panel.

30. Push molding downward and forward past A-pillar structure.

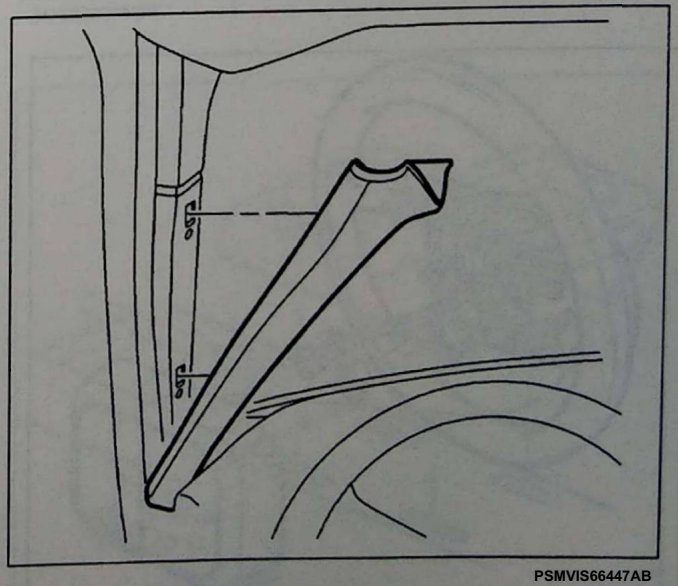


PSKMS66448M

31- Push molding to structure pressing forward and outward to insure proper fit to instrument panel, headlining and door seal.

32. Align clips on garnish molding to slots in A-pillar and press firmly at clip locations.

33. Position flap on door weatherstrip over windshield garnish molding.



PSMVIS66447AB

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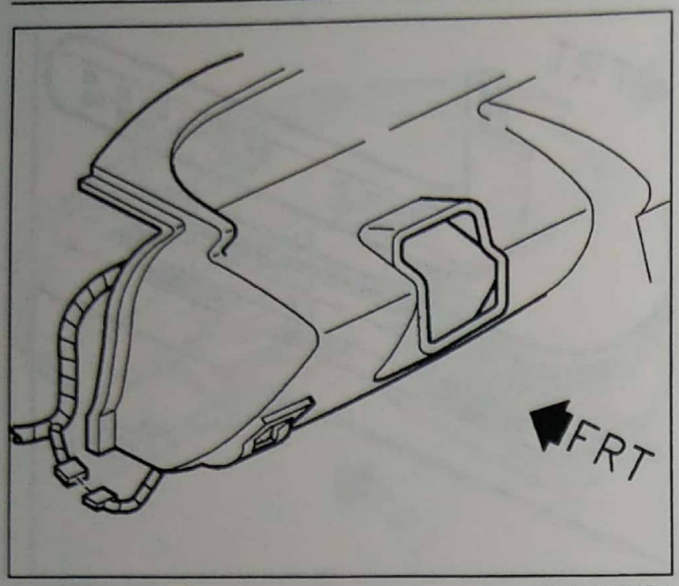
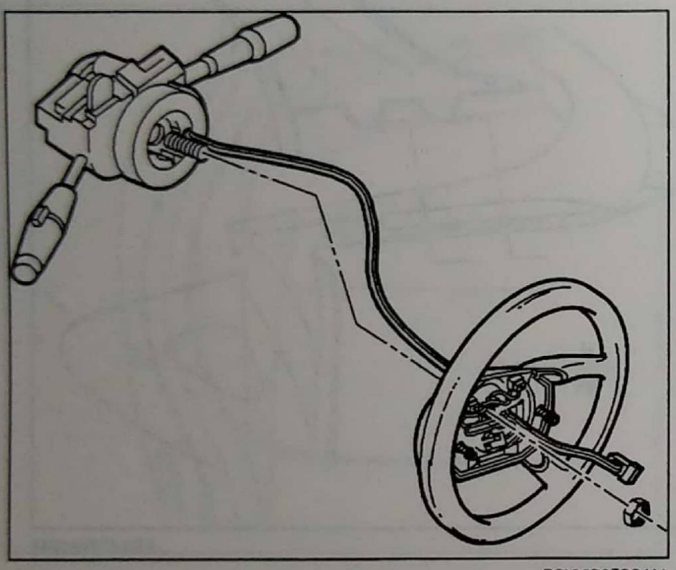


PSMVIS65865AA

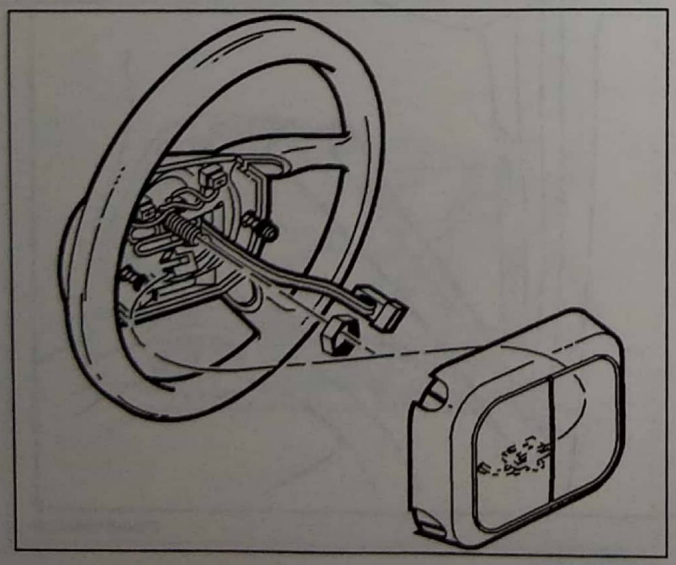
34. Connect park brake switch connector.



PSMVIS65864AA

35. Route SIR cable through steering wheel. Install steering wheel to column.
36. Connect horn wire connector.
37. Install steering wheel nut.

Torque: 42 N*m (31 ft—lbs)



PSMVIS65863M

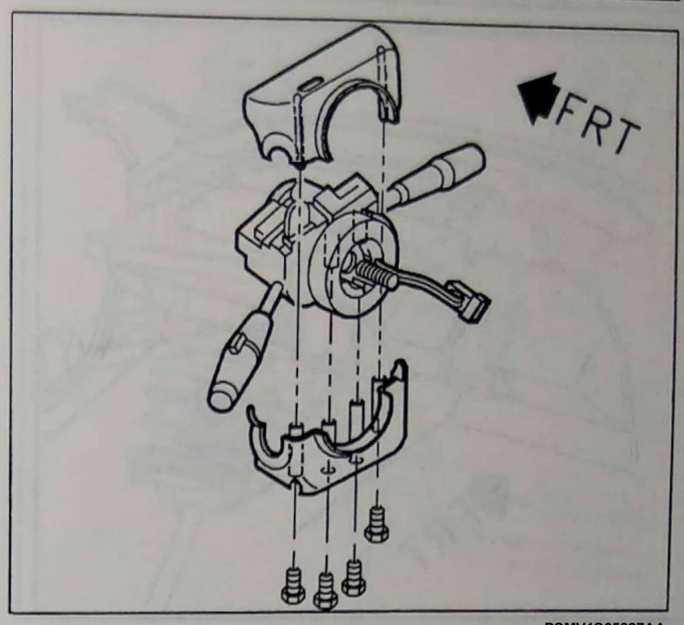
38. Route yellow SIR inflator module wire harness within the steering wheel hub forming an “S” shape with wire and connect SIR inflator module connector.
39. Install CPA, to connector.
40. Install inflator module to steering wheel.

Torque: 10 N*m (89 in—lbs)

CamScanner

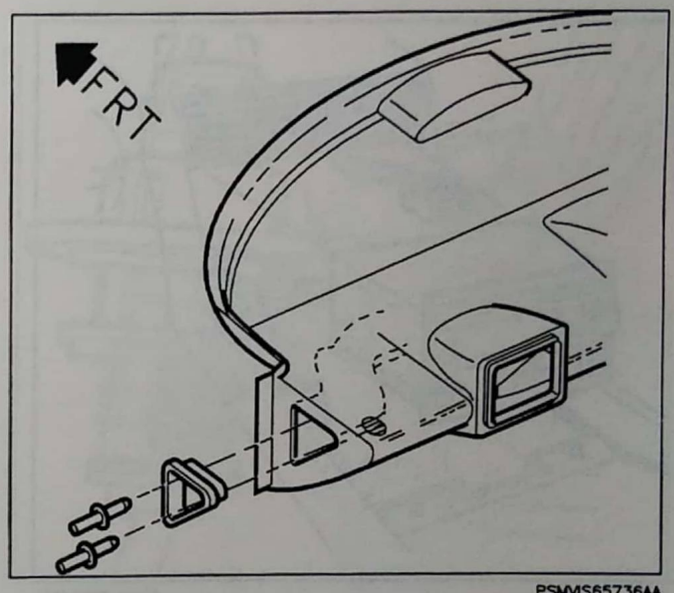
4] Align lower steering column trim cover to steering column. Install and tighten inner screws.

42. Align upper steering column trim panel to steering column and install outer screws in lower steering column trim panel. Tighten outer screws. *



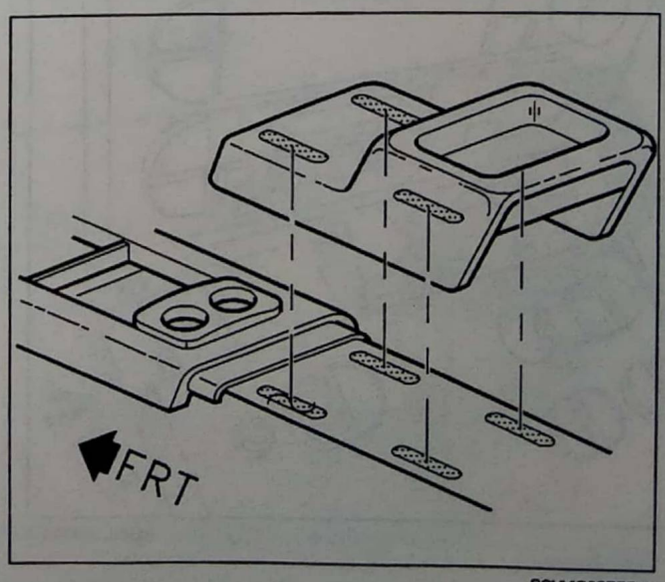
PSMV1S65827AA

43. Install left and right front side door air outlets on side of the instrument panel using new fasteners.



PSMVS65736AA

44. Install arm rest



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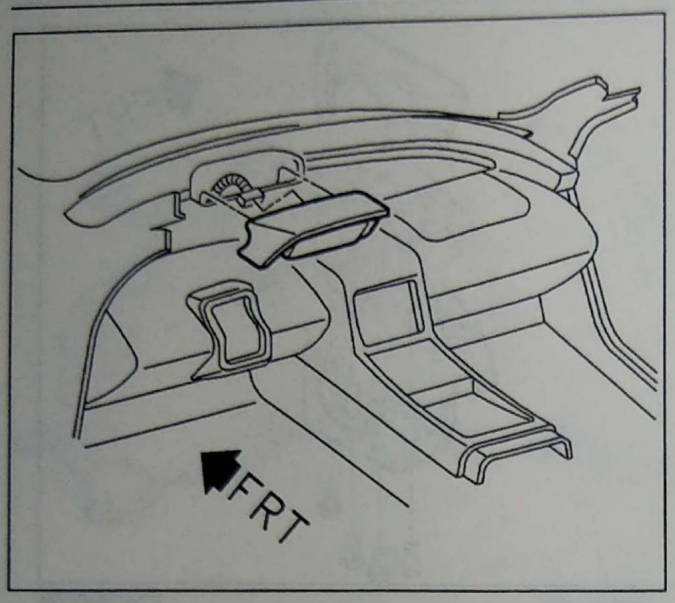
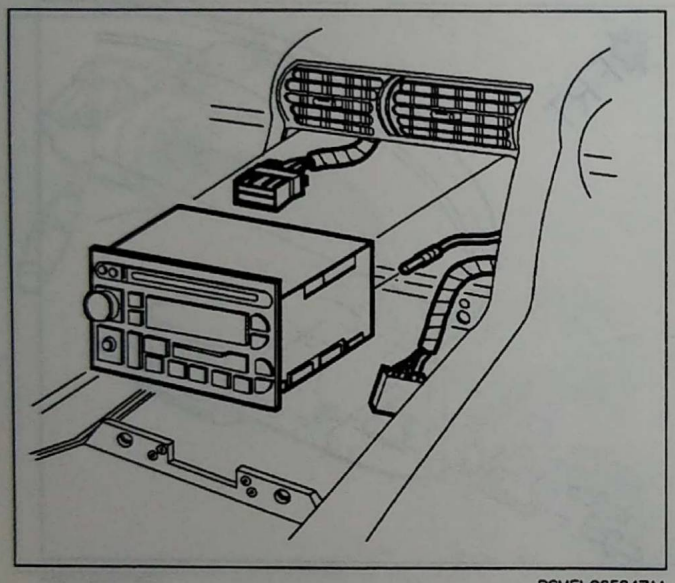


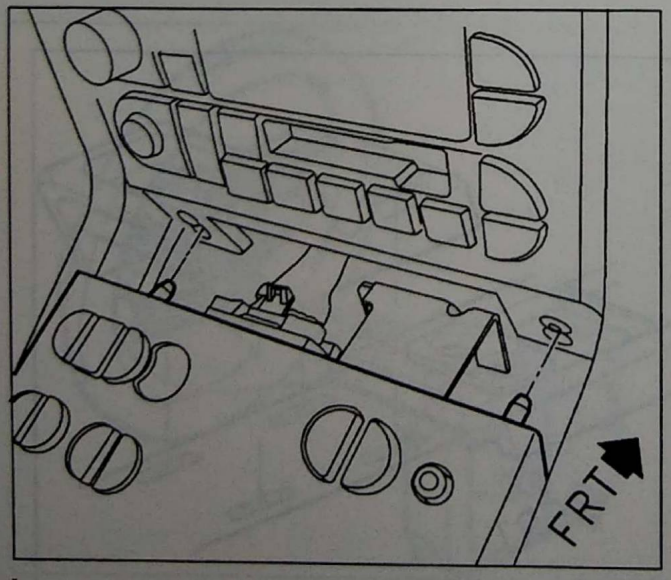
PSMELC66359M

45. Push harness connector into socket on instrument panel cluster. Verify connection is made, seated and locked.
46. Install instrument panel cluster into instrument panel by pushing forward and downward.



PSMELC65847AA

47. Connect radio harness to radio, then antenna lead to radio. Verify both connections are seated properly.
48. Make sure antenna and harness are up and out of the way of the radio bracket. Slide radio into opening until the radio is seated and the radio fits tightly to the console. You may hear a click as the radio tab locks into the bracket.



PSMELC66360M

49. Cover the radio face with a rag for protection during RSA installation. Install shift cable housing into shift bracket and connect and secure shift cable to shifter. Be sure clip lock tab is in place.
50. Connect wire harness connector to RSA.
51. Align RSA locator tabs to front of instrument panel and push down on the rear of the RSA.
52. Install TORX™ fasteners.

Torque: 6 N*m (53 in-lbs)

IMPORTANT: You must adjust shift cable at final drive unit.

53. Adjust shift cable:

IMPORTANT: The shift cable must be attached to the RSA with the RSA secured in position. Shift handle must be placed in neutral before cable adjustment is performed.

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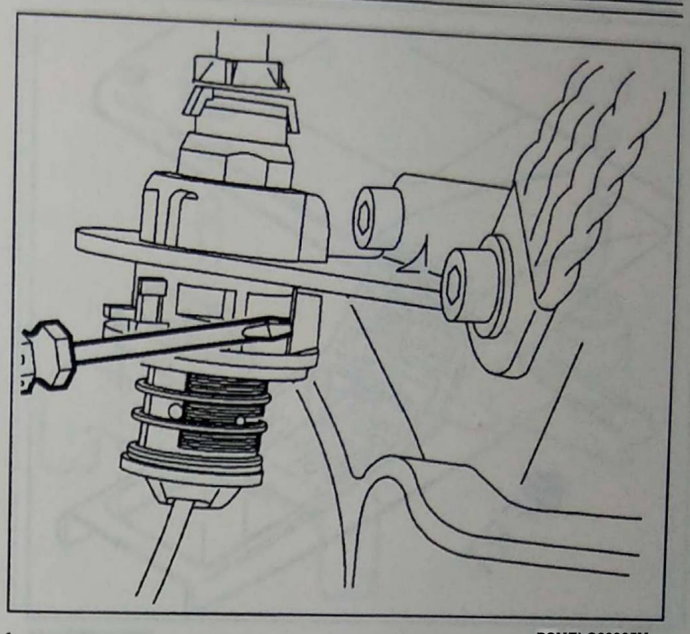
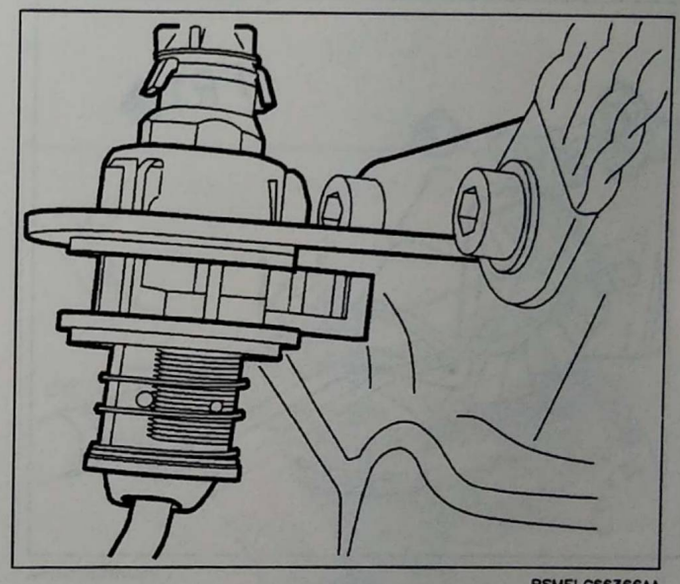
a. Remove underbody front air deflector assembly (Refer to "Underbody Front Air Deflector Assembly" in this manual.)

b. Unlock U-shapcd adjustment collar. Collar is located aft of drive unit bracket, and will unlock by inserting a pocket screwdriver into gap and prying towards drive unit.



PSMELC66365M

IMPORTANT: About 13 mm (1/2 in.) movement necessary to insure unlock position.



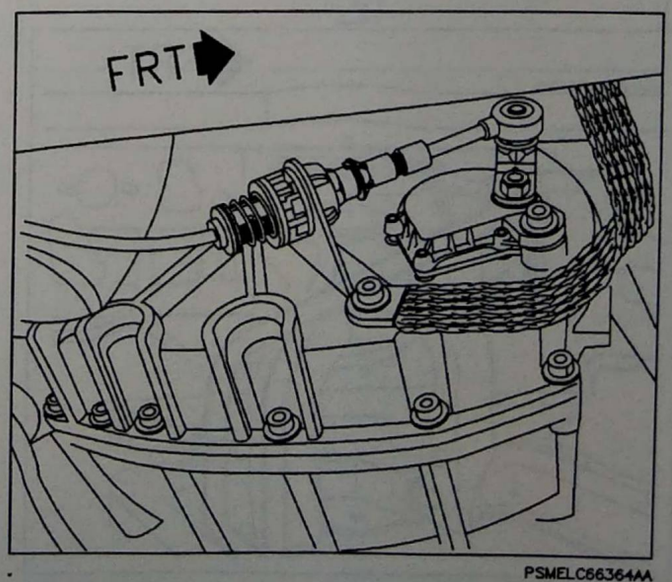
PSMELC66366AA

c. Verify shift lever is in neutral. Push U-shaped collar into lock position. Collar will move to right side of vehicle.

d. By hand shift park/lock lever to the full counterclockwise position (DRIVE) then move one detent in the clockwise direction (NEUTRAL).

e. Install underbody front air deflector assembly. (Refer to "Underbody Front Air Deflector Assembly" in this manual.)

NOTICE: If shift cable has been removed more than six times at either end, for any reason, the cable must be replaced.



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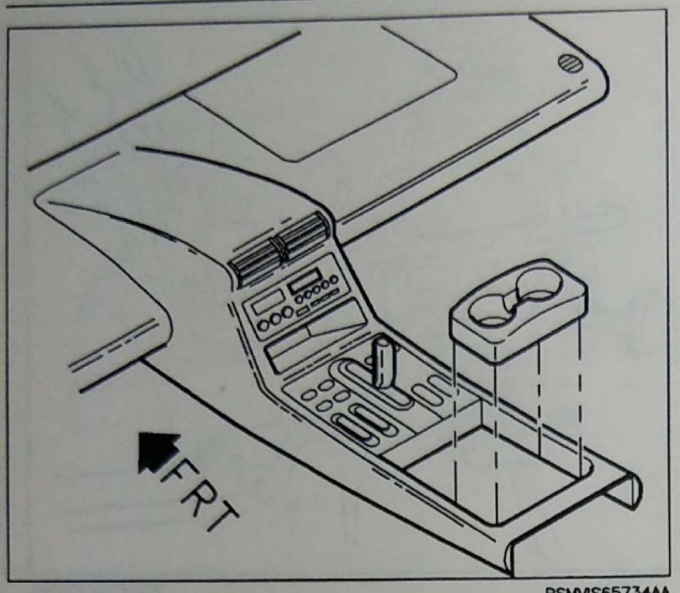
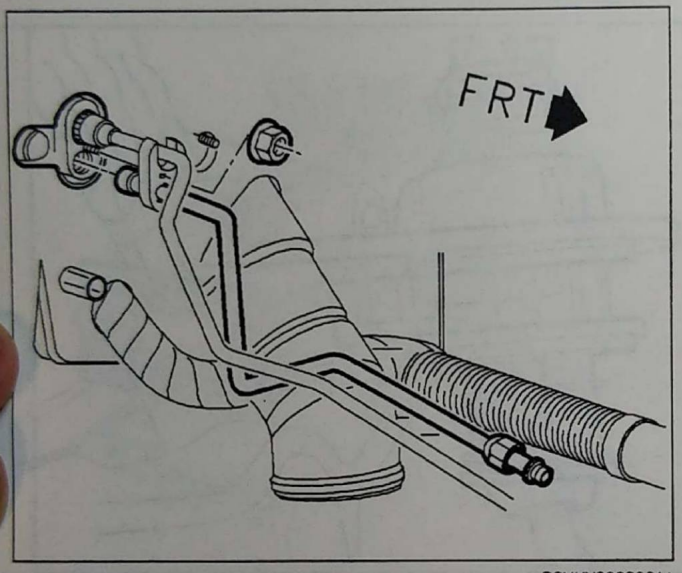


PSMVIS65734AA

54. Install cup holder to center console.
55. Enable the SIR system. (Refer to "Enabling the SIR System" in this manual.)



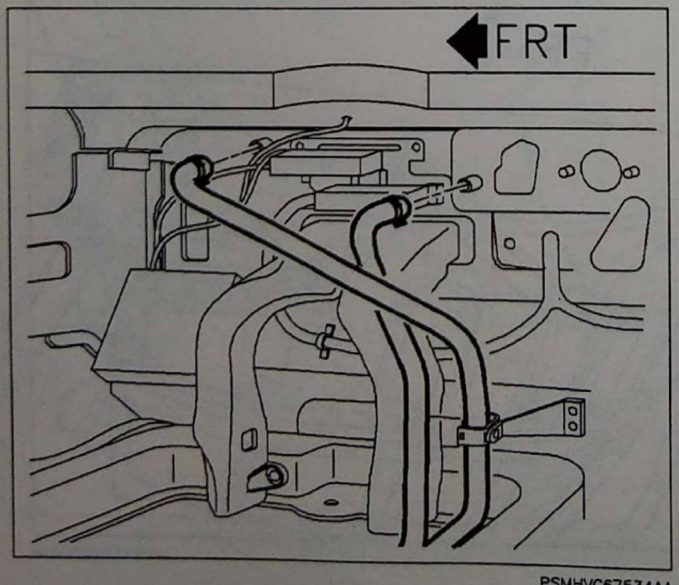
PSMHVC66802AA

56. Remove O-ring from evaporator tube and condenser tube, install a new Electric Vehicle approved service replacement O-ring.

NOTICE: Use on R-12 Refrigerant oil (mineral) to lubricate O-rings. Use of R—134a (PAG) oil or R—134a heat pump (ester) oil will cause premature corrosion of fitting joints.

57. Lubricate O-ring with R-12 mineral refrigerant oil.
58. Connect condenser tube to evaporator.
59. Connect evaporator tube to evaporator.
60. Install evaporator tube nut and tighten.

Torque: 16 N*m (12 ft—lb)



PSMHVC67534AA

61. Install heater inlet hose and clamp to heater core inlet. Position clamp tangs at 12 o'clock.
62. Install heater outlet hose and clamp to heater core inlet. Position clamp tangs at three o'clock.

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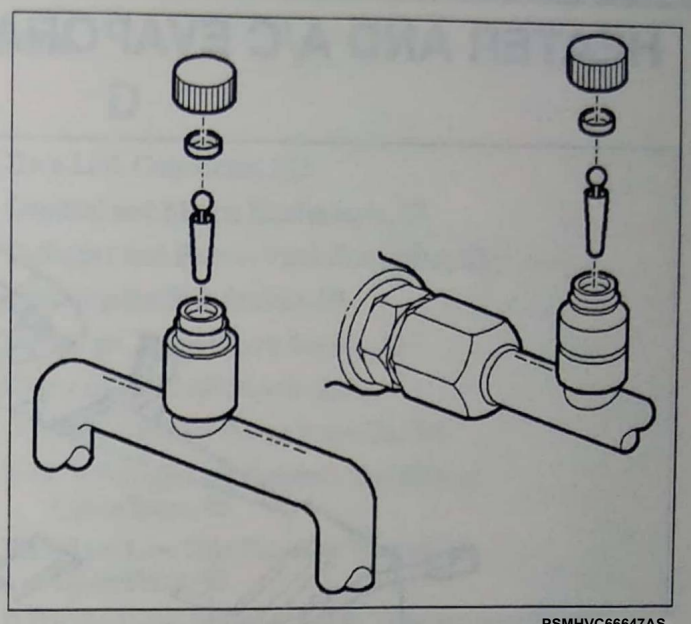
63. Install new Electric Vehicle approved service replacement heat pump schrader valves.

64. Evacuate, charge, and leak test heat pump system.

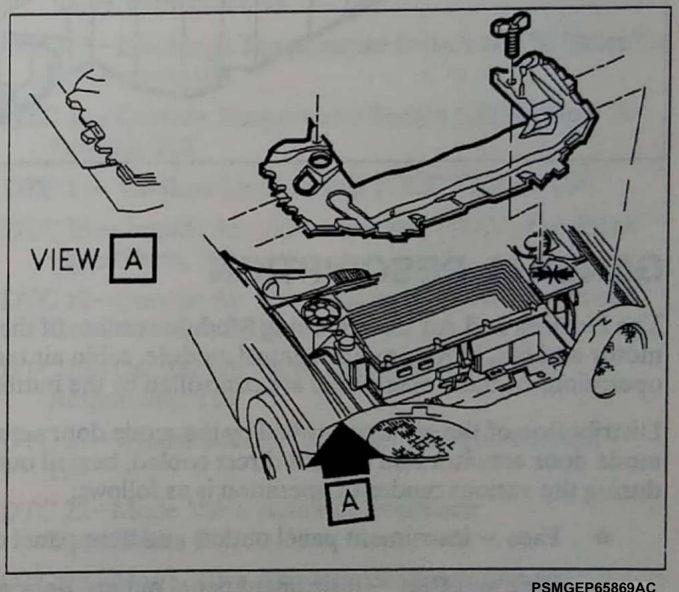
65. Fill coolant system. (Refer to "Coolant Fill Procedure" in this service manual).

66. Verify heat pump operation by performing system performance test.



PSMHVC66647AS

67. Install engine compartment sight shield.



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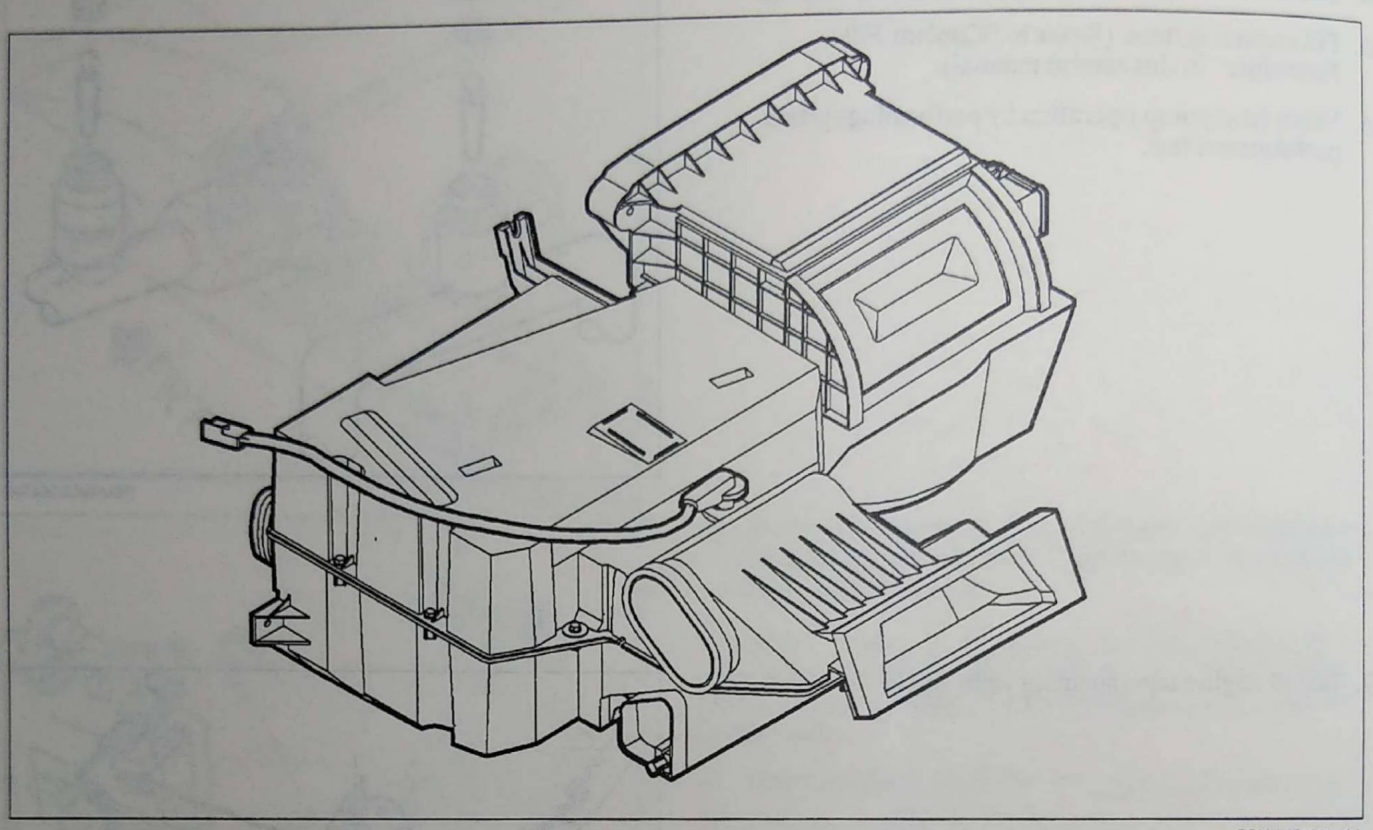
HEATER AND A/C EVAPORATOR AND BLOWER MODULE



PSMHVC67396AA

GENERAL DESCRIPTION

The Heating and Air Conditioning Module consists of the outside air valve actuator, mode door actuator, blower motor and fan, blower motor control module, cabin air temperature sensor, heater core and evaporator core. The operations of these assemblies are controlled by the buttons on the run/lock shifter assembly (RSA).

Distribution of the air is controlled by the mode door actuator and buttons on the RSA. The various position of the mode door actuator and buttons direct cooled, heated outside or inside air through the air ducts. The flow of air during the various modes of operation is as follows:

- Face - instrument panel outlets and door panel outlets
- Face and Feet - instrument panel outlets, door panel outlets, and floor outlets with a small amount of bleed air to the side window demisters.
- Feet - floor outlets with a small amount of bleed air to the side window demisters

Evaporator Core:

In the cooling mode the evaporator is a device which cools and dehumidifies the air before it enters the passenger compartment. Low pressure liquid refrigerant flows through the orifice tube into the evaporator. The heat in the air passing through the evaporator core is lost to the cooler surface of the core, there by cooling the air. As the process of the heat loss from the air to the evaporator core surface is taking place, the moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water.

In the heating mode warm coolant is circulated through the heater core and the evaporator would then become a condenser which warms the air before it enters the passenger compartment. High pressure refrigerant vapor is pumped from the reversing valve to the evaporator. The cold air passing through the evaporator core absorbs the heat from the evaporator core, there by warming the air.

The heating and A/C module is service complete with actuators, blower motor, and blower motor control module. Internal module components are not serviced.

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- Heat Pump Ventilation/Thermal Control Module

. Diagnostic Charts

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. Air Conditioning C

- Heating
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NOTE: H Refer to th e "S'in "“ back “f thls manual or the Table of Contents tn the front of th.s manual for location of specific component.

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